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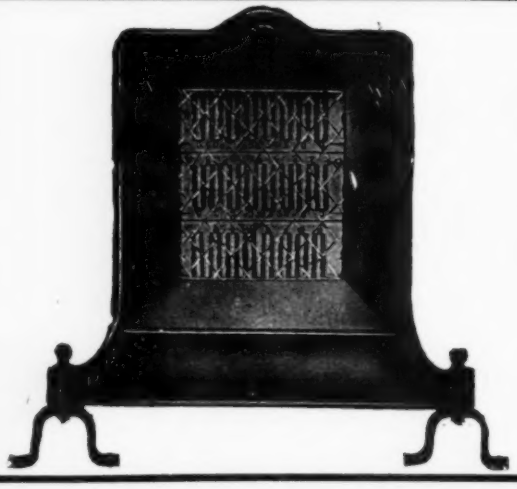

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The

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Restrictions on Wireless Experiments.

IN the autumn presidential address to members of the Radio Society of Great Britain last week, Dr. W. H. Eccles, M.I.E.E., F.R.S., referred to the restrictions imposed on amateur radio experimenters by the Post Office authorities, and drew attention to the anomalies that had arisen as a consequence of the licensing system.

Last Easter the Society took part in the International Congress at Paris, and was represented on the International Committee which is to frame schemes next Easter for international amateur work. Shortly after those events the Post Office commenced to issue permits to experimental transmitters containing new and unexpected restrictions. The one striking directly at the co-operation suggested above is numbered 7, and reads:—

"Messages shall be transmitted only to stations in Great Britain or Northern Ireland which are actually co-operating in the licensee's experiments, and shall relate solely to such experiments."

Such an unjustified condition may harmfully affect the development of radio communication, for it is in the possibility of unexpected reception at distant places that a good deal of the usefulness and interest of this class of work lies. The volume of continental amateur transmission that can be heard in this country from dusk to midnight is vastly greater than the whole volume of our own; moreover, it was the amateurs who discovered the valuable properties of short waves for long-distance communication, and their work has resulted in the development of the Marconi "Beam" system. This seems, therefore, quite the wrong time to introduce restrictions which will make a free gift of this field of research to the amateur workers of other nations, as Dr. Eccles pointed out.

The precise aim of the limitation is far from clear; in so far as it relates to *what* is radiated, it can be understood, but, if experimental messages are to be transmitted, surely the authorities cannot object to their reception!—no matter who may be the recipient. The president thinks the restriction may have been conceived without information as to the methods necessary for carrying out this valuable range-finding work, which contributes something to progress by affording records of the variation of signal strength. The P.O. maintains that the rule merely embodies a recognised practice, and that each experimenter desiring facilities for oversea communication should

furnish particulars and evidence of an arrangement for co-operation with a foreign or colonial station, but Dr. Eccles points out that it is obviously impossible to make prior arrangements for reception from unexpected localities and for the acknowledgment of their receipt. There are some experiments for which the method can be foreseen, but in most cases both the method and the apparatus must be evolved as the work proceeds. An applicant for a permit to try experiments of the latter class is refused a licence, and this is quite contrary to the letter and spirit of the Statute. The consequence has been that some surprising anomalies have arisen: for instance, the Council of the Radio Society submitted a list of names of applicants of whose *bona fides* and competence it was assured, but all were rejected, although at the same time licences were being granted to inexperienced beginners. Dr. Eccles is informed that the solution of this mystery is that some of the successful applicants for permits copy a few pages out of a technical treatise or published paper and present the result as a description of their proposed research. If his information is correct, he has exposed a state of affairs that is nothing short of disgraceful, and the sooner the system which allows such methods to be practised is altered the better.

We are disposed to agree with Dr. Eccles that, even in those cases where a problem can be defined and a method tentatively suggested, the desire of the Post Office to weigh the scientific value of the experiment before granting the permit is unpractical; such an adjudication is worthless, and the president is right in suggesting that no scientific man or body would presume to undertake the responsibility. The restriction of the use of a transmitting station to a few minutes a day between specified hours, and to very small power, thus depriving the licence of nearly all its utility, is also a severe and regrettable curb on scientific work.

The Council has received so many protests from all over the country that it has had to inquire under what Act of Parliament, and for what national or other reasons, such restrictions as have been referred to are imposed. It has found no answer. The position is somewhat analogous to that which was encountered when radio broadcasting commenced in this country, and the remedy is equally obvious. If the Post Office authorities found it necessary to rectify a mistake then, surely they ought to do so in the present instance, which is vastly more important in that the regulations in force are hindering scientific discovery, and are bound to react adversely on invention and technical improvement.

The remedy, we agree, is to recast the regulations in the light of the experience of other progressive countries so that the British may attain an equal measure of freedom and be put under the same obligations as their fellows in the United States, France, and elsewhere.

In conclusion, it may be recorded that as a sequel to the address, the Radio Society of Great Britain has been offered two sums of £500 each to assist in fighting a test case with the Post Office authorities.

The Opportunities of Winter.

In contrast to many branches of trade, electrical business has no reason to fear the approach of winter. In fact, at this time of year there begins a season of great opportunities for sellers of electrical goods. During the past few months lighting hours have been short, fires have not been needed (at least not to a great extent), and the usual slump in "listening in" has been experienced. With the restoration of the hour lost in April, all these matters assume a more important aspect, and the electrical dealer who takes the necessary steps can secure a great amount of the business which now becomes available. Not only must the public be supplied with actual necessities—new lamps, heating elements, and other replacements—but also the desire for additional electrical aids, such as fires, with which we deal in this issue, must be cultivated. It is often forgotten that the general public still knows very little of the benefits of electricity, with the two exceptions, probably, of lighting and traction. Conservatism and the fear of incurring undue expense have to be combated and dispelled.

How best to do this is a matter to be studied in the light of local conditions, including, of course, the financial position of the dealer himself. The medium of the circular letter may be employed—a number of useful suggestions in this connection were made by a contributor to our last issue; full use may be made of the advertising space of local newspapers; and much may be accomplished by means of attractively-dressed shop windows, to say nothing of the interiors.

It must be borne in mind that newspaper advertising and circular letters must have something behind them. They may bring people up to the shop, but a poor display is likely to turn them away again. On the other hand, unless the shop is situated in a busy thoroughfare even an attractive window will not lead to sales if attention is not drawn to it by discriminating advertising.

This leads to the conclusion that the two methods must be combined in practically every case. In both directions the assistance of a number of the larger manufacturers can be called upon, and, on the advertising side especially, the British Electrical Development Association will give invaluable aid to those who ask for it. Pamphlets overprinted with an electrical dealer's name and address are easily obtainable, and assistance is also given in the preparation of newspaper advertisements, the dressing of shop windows, &c. We have recently received particulars of well-worked-out schemes for window displays in which a great part of the necessary material can be given or lent to retailers. Many dealers will no doubt prefer to work out their own ideas independently of the manufacturers, but these will also benefit by a study of the material supplied.

We urge all sellers of electrical appliances to take the fullest possible advantage of the assistance which is so easy obtainable, and thus help in the electrical education of the public, while getting the best results out of their business.

Tramway Burdens.

Unlike the electricity supply business, the tramway industry is still suffering from "the uses of adversity"; as was shown in the presidential address of Mr. John Barnard at the Municipal Tramway Conference recently, it is badgered by its customers for reductions of fares, and by its working staff for increased wages, and all the while it groans under the unfair financial burdens, resulting from legislation that has long been obsolete, which prevent it from driving its more fortunate competitors off the road. Mr. Barnard points out the necessity of co-ordinating the various means of passenger transport under a single authority, a policy already carried into effect in the case of the railways, and identical in principle with that which the Electricity Commissioners are endeavouring to apply to the electricity supply industry.

It is indeed singular that the incessant efforts of the tramway industry, which is largely in municipal hands, and which is undoubtedly a "public utility service," whatever the ownership, to free itself from the handicaps imposed upon it, have been utterly fruitless. The difficulties have been increased in the case of the municipalities by the fact that any financial relief that they may obtain for their tramway departments will reduce the sums allotted to them from the Roads Fund. This position arises wholly from their fulfilling the dual functions of tramway management and road maintenance; the tramway companies are not so situated, but on the other hand, as dividend-earning (?) corporations, they have not the same influence as local authorities.

Thus the tramways are obliged to maintain roadways which they do not wear out, in order that the municipalities may receive moneys for the repair of other roadways, and the injustice is perpetuated. Were it not for this and other impositions, the tramcar would be without a rival for passenger transport in urban areas.

The Electric Launches at Wembley.

The Lakeside Charging Station.

ALL visitors to the British Empire Exhibition must have seen the pleasure launches on the lake, but how many of the general public realise that the propelling medium of the boats is electricity? The fact is by no means evident to the uninitiated; nevertheless, each launch, of which 30 capable of carrying 30 passengers each were built by Messrs. John I. Thornycroft & Co., Ltd., is driven by an 80-volt motor, the electrical energy being derived from a battery of accumulators housed 10 under each seat.

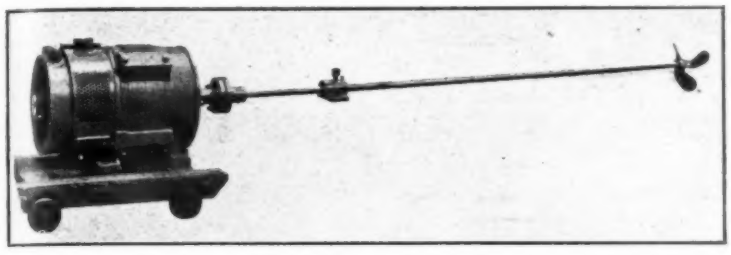

Fig. 1.—Motor and Propeller.

Each launch battery consists of 40 cells of the 11-plate F.K.A. type in ebonite boxes with sealed lids of "Dagenite"; the cells have a capacity of 190 Ah when discharged at the 5-hour rate, and the Pritchett and Gold and E.P.S. Co., Ltd., supplied the 30 batteries, or a total of 1,200 cells.

The 2.5-h.p. driving motors are of the series-wound, reversible, enclosed ventilated type, provided with ball bearings. The machines were specially constructed by Messrs. Submersible Motors, Ltd., to run silently, and they do so, being similar to those supplied by the firm to boat builders on the upper reaches of the River Thames for installation in electric canoes. The motors, one of which is illustrated in fig. 1, run at a speed of 650 r.p.m., are one-hour rated, and connected to the propeller shaft through a flexible coupling, a thrust bearing being provided. The "Submersible" controllers are of the series-parallel pattern, giving two forward and two reverse speeds and an "off" position.

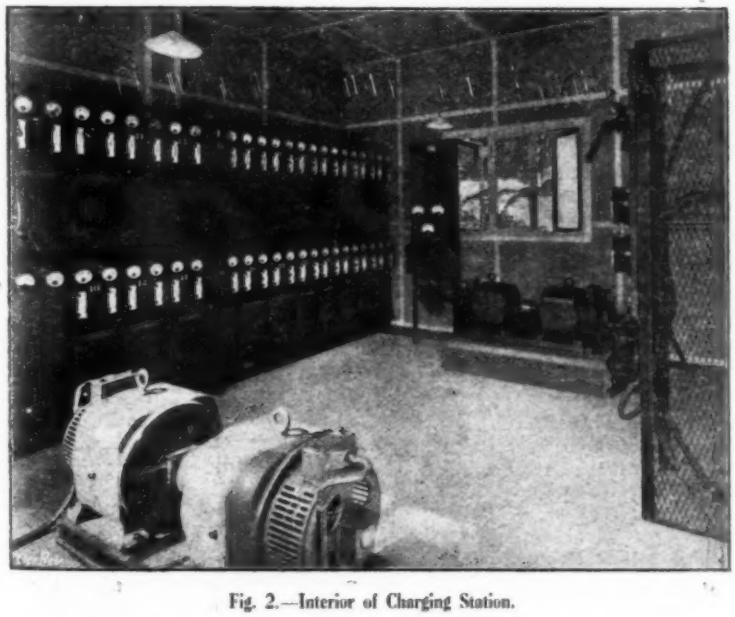

Fig. 2.—Interior of Charging Station.

The d.c. supply available consists of a 3-wire system at 440 volts between the outers, and it was therefore decided to charge the batteries four in series, balancers being accommodated in a kiosk built for the purpose at the north-east corner of the lake (fig. 3).

The plant consists, as shown in fig. 2, of two 3-wire balancers, each comprising two shunt-wound machines coupled direct on cast-iron bedplates, and each capable of dealing with an out-of-balance of 50 amperes. The following switchgear is installed: (i) One main incoming panel, as shown to the right of fig. 2, having mounted upon it a 300-amp. d.p. circuit breaker, fitted with overload and reverse current trips, together with ammeters and voltmeters in each outer main and between each outer and the neutral. (ii) Two balancer panels, one of which is to be seen against the window, fig. 2, each with one 50-amp. s.p. circuit breaker with overload and reverse current trips, two voltmeters each reading to 150 volts, one central zero ammeter, and a starting rheostat for the balancer.

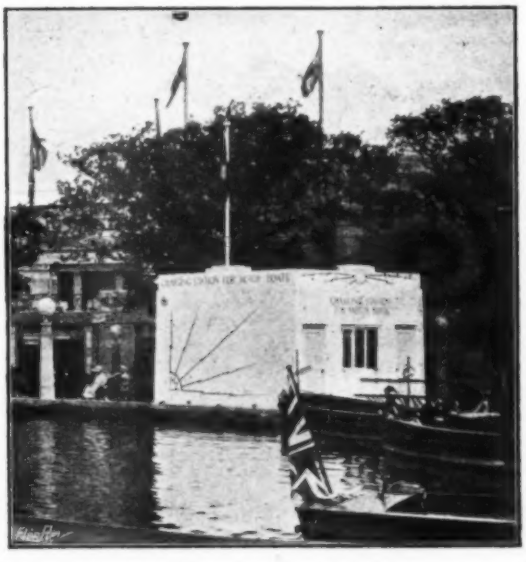

Fig. 3.—Charging Station and Launches.

The charging panels are 30 in number, one for each launch, built up into one switchboard which extends the whole length of the south side of the kiosk. Each panel carries: one d.p. 50-amp. q.b. knife switch; two 50-amp. s.p. Home Office type fuses; one regulating switch and charging resistance; one indicating lamp and socket; one ammeter, 50-amps.; and one voltmeter, 120 volts.

The whole of the switchgear is fixed on slate panels, mounted on angle-iron framework, and arranged sufficiently far from the walls to allow of easy access to the back of the

various boards. The cables between the various boards and the machines are all placed in trenches which were constructed in the floor adjacent to the walls and are covered with plates.

From the charging panels 30 separate sets of charging leads are taken in a trench along the side of the lake to mooring posts, which are constructed of standard w.i. pipe fittings and equipped with a ring at the top for the boat's painter and a three-pin charging plug at the side, the cable to the plug running up the centre of the post. From the plugs a cab-tire twin flexible cable is taken to the charging terminals on each boat. Thus as soon as a boat is moored in its correct position and the flexible lead plugged into the post, the corresponding lamp in the charging station lights up and the attendant can switch on and begin charging, regulating the current as required in accordance with the readings of the instruments on each panel.

The whole of the charging equipment was supplied and installed by Messrs. Drake & Gorham, Ltd., and the switchgear was also manufactured at their Rockingham Works.

The International Cologne Fair.

By T. F. WALL, D.Sc., D.Eng.

The strenuous attempts of Germany to regain something of her former importance in the commercial world cannot but be of interest to the industrial communities in every country, and the Cologne Fair, being the most recent effort for this purpose, deserves serious attention.

The industries of Western Germany employ more than 25 per cent. of the whole of German labour, and the Cologne Fair has been organised for the purpose of providing an international market for the products of these industries. Cologne is one of the greatest traffic centres of Germany and the chief town of one of the most important industrial districts in the world, particularly in connection with iron, steel, engineering, cutlery, textiles, &c. The first Fair was held in the spring of this year, and it is the intention to hold it twice a year.

The writer has just returned from a visit to this Fair, and ventures to submit some impressions and information obtained for the consideration of the readers of the Electrical Review.

The introduction of the *rentenmark* last year and the stabilisation of the currency was followed by a severe crisis for the whole of the German economic system. During the period of inflation, goods found ready buyers to almost any extent, owing to the peculiar condition of the money market, which was flooded with newly-printed paper money. The consequence was that everyone endeavoured to turn his paper money into concrete assets immediately, in order to escape the possible total disappearance of its value in perhaps a few days' time. Since stabilisation has been effected, a violent check has thereby been placed on buying and selling, and a partial stagnation has resulted.

The *rentenmark*, or gold mark, is now worth a little more than one shilling, and is actually equal to one billion (that is, one million million) marks.

The results of the Fair have been a severe disappointment to the promoters, in so far as the actual amount of business done is concerned. Relatively very few orders were booked and the attendances were meagre. The chief activity centred round the textile departments, and these seem to have been comparatively well supported.

The prices asked were surprisingly high, almost without exception. The reason for this appeared to be that, although wages are low, the costs of materials are high, and the latter influence more than counterbalances the former. For example, books are expensive, because paper is costly; static condensers are dear because of the high cost of insulating materials; accumulators are dear because the metal lead is expensive. In connection with the accumulator industry, it is of interest to note that the lead required for the plates is largely imported from England.

The German manufacturers have great difficulty in obtaining credit, and they are evidently looking forward to the proposed loan of £40,000,000 in the hope that it will be a powerful means towards establishing their credit. The complaint expressed on every hand was that practically no business was being transacted at the Fair, due to the scarcity of money.

For the purposes of the present article, the most interesting exhibits were those of the electrical industry. Whilst there was not any startling novelty, there were a good many interesting and suggestive products to be seen. In the following a brief account of what are thought to be among the most interesting will be given.

Magnetic Separation of Iron from Other Materials.

This is a new development of an old and well-known process in which the mixed materials are passed over a revolving drum, one half of which is subject to an internally-produced magnetic field, and the other half is maintained as much screened as possible from any magnetic field. The feature of this new development is the manner in which one half of the drum is almost completely screened from the stray flux from the powerful magnetic field produced in the other half. This is effected by means of a magnetic shunt placed under the non-magnetic half of the drum, thus providing a path for the leakage flux and preventing it from exerting any influence on that half of the drum.

It is rather surprising to note the very extensive applications found for this magnetic method of separating iron from other substances. One of the most striking instances is the withdrawing of iron scrap from raw cotton. Cotton wool is delivered to the mill in bales bound with iron straps and clamps. When taking off the straps, it frequently happens that broken pieces of iron drop into the cotton wool, and if they are allowed to pass on to the preparing and spinning machinery, the danger is twofold, *viz.*: (i) the iron scrap, when struck by the machine parts, may produce sparks which could easily ignite the cotton wool and so give rise to a disastrous fire; (ii) the spinning machinery may be seriously damaged.

It is curious to note that the application of this magnetic separation method has resulted in separating out such diverse articles as a spanner, nails, hairpins, iron bolts, pieces of wire, &c.

Other substances which are cleaned in this way are cocoa and chocolate beans (one well-known firm of chocolate manufacturers has 26 machines installed for this purpose), sugar, cement, china clay, rubber scrap, asbestos, crushed bones, &c.

Agricultural Applications of Electricity.

Within the last two or three years a very large number of high-pressure overhead transmission lines have been erected in Germany for a pressure of 100,000 volts and for distances of from 60 to 300 kilometres. By this means electricity supply has become available for enormously extensive areas of the agricultural districts. Considerable attention has therefore been given to agricultural applications of electricity, and the main development has been to make the machines as foolproof and dust and weatherproof as possible. For example, a three-phase induction motor was shown, in which the

complete starting switch and rotor resistances are built into the machine frame so that the operations of starting and stopping consist merely in turning a hand wheel through half a revolution in one direction or the other. The starting resistances and contacts are fixed to the shaft and rotate with the shaft so that no slip-rings are necessary. The completely-enclosed arrangement for the starting switch and starting resistances make it impossible for any sparking to set fire to inflammable material, e.g., hay, &c., amongst which the motor may be at work.

Domestic Electrical Appliances.

A good many of the exhibits referred to a variety of labour-saving and other appliances for use in domestic work. A new type of electric flat-iron was shown, which is constructed in accordance with a Swiss patent. The special feature of this iron is that a receptacle with an adjusting valve is provided for water which may be allowed to drip into a groove on the inside of the hot plate. A row of small holes is provided adjacent to the groove, and as the water drips on to the hot inner surface of the plate, steam is generated which passes through the holes and moistens the cloth which is being ironed.

This new type of electric iron was first shown at the Leipsic Fair in the early part of September, and already 21,000 have been sold. The price of the iron is about 21s. at the works.

Vacuum Tube Rectifiers.

A complete range of static rectifiers was shown for use in charging batteries. For charging currents up to 0.6 ampere, the glowing cathode plate rectifier is suitable; for currents up to 1 ampere a filament rectifier; and for larger currents the Wehnelt rectifier.

One new arrangement was demonstrated whereby the low-pressure, direct-current source (e.g., the accumulator on charge) may be used to supply direct current whilst the charging operation is in progress.

Protective Device for High-Voltage Transmission Lines.

This is a development of the horn type of arrester. The objection to the simple form of the horn arrester is that when the high-voltage discharge takes place across the horns, an appreciable time is required before the arc mounts to the wide part of the horn gap, and is so broken. The time thus taken to break the arc may be of sufficient duration to allow the installation to be seriously damaged. By means of an electromagnetic device which is operated by the discharge current as soon as the spark appears at the horn gap, the circuit in series with the horn is opened and immediately closed again, thus definitely stopping the discharge and then establishing the conditions ready for dealing with any further high-voltage discharge which may take place. In this way the high-voltage dissipation may be brought to completion in from one-tenth to one-quarter of a second. A counting drum is geared to the electromagnetic device so as to indicate how often the mechanism is brought into action. In this way it is possible to ascertain which parts of the line are most subject to the high-voltage accumulation, and this permits of special precautions being taken at the most dangerous places.

High-Voltage Testing Transformers.

A high-voltage testing transformer built for the Munich Technische Hochschule was exhibited. The transformer developed a pressure of 200,000 volts at the secondary terminals (*i.e.*, 100,000 volts to earth), the capacity being 20 kVA and the supply frequency 50 cycles. The price of this transformer was about £240 at the works.

Static Condensers.

A very complete range of static condensers was shown, including units for 800 volts, 6,000 volts, and 60,000 volts respectively. The prices were as follows:—Condensers for 6,000 volts, £3 10s. per kVA; condensers for 60,000 volts, £6 10s. per kVA. For a 1-microfarad condenser for 800 volts at 50 cycles the price was about 22s.; all prices *ex* works.

Compensated Induction Motor.

This machine is a development of the Heyland principle for improving the power factor of induction motors. A commutator and also slip rings are provided on the rotor, and the stator winding is short-circuited.

Phase compensation of induction motors is of considerable interest in Germany at present, owing to the necessity for running the existing cables at their fullest possible capacity. There seems, however, to be an impression that power-factor improvement devices, as auxiliaries to induction motors, are of rather temporary interest, owing to the impossibility of obtaining capital to reorganise the existing cable installations and providing larger cables to meet the extended demand on the supply system.

Single-phase Installations.

The almost universal application of three-phase current at the standard frequency of 50 cycles has been an immense advantage to the German electrical industry. The only towns of note in which the three-phase system is not used are Cologne, Hamburg, Dusseldorf, and a few others. These towns have a single-phase supply, the reason being that they were the first to make use of electric current for industrial purposes, and their installations were completed before the development of the three-phase system had taken place. There is no doubt, however, that in a few years' time these single-phase systems will be replaced by three-phase installations.

A single-phase commutator motor was shown which could run in either direction, and was capable of a speed adjustment of 50 per cent. by brush regulation.

High-Speed Electric Shears.

One blade of the shears is stationary and the other blade is fixed to a disk which is driven at a high speed by means of a fractional horse-power motor. The shears will cut sheet steel in any required shape of curve at a rapid rate. The apparatus is an American invention.

Automatic Minimum-Current Circuit Breaker.

A special feature of this device is its application to three-phase circuits. The three-phase switch blades are mechanically separate, and when the switch is closed each blade is kept in position by an electromagnet. The connections of the electromagnets are so arranged that if one phase fails, the three blades successively open, and thus the faulty circuit is disconnected from the mains.

Boiler-house Recording Apparatus.

Great attention has been devoted to recording apparatus which tends to ensure economy of operation, and in particular a novel feature was a recording device which showed simultaneously the gas pressure at three different parts of an installation as, for example, under the furnace grate, in the furnace, and at the chimney base. In this way a very strict supervision of the operation of the installation may be obtained.

A special section of the Fair was occupied by exhibits of the Soviet Republic. These exhibits were generally regarded as a somewhat dramatic novelty rather than a serious matter of business. The chief features were the display of those products which are, and which probably must always be Russia's main lines of commerce, *viz.*, animal produce, such as skins, furs, feathers, &c.; vegetable produce, such as grain; and minerals, such as tar products, oil, soda, ores, &c.

The manufactured goods which were exhibited, such as toys, handworked lace, porcelain art ware, &c., were a subsidiary feature.

These exhibits attracted a great deal of attention, but very little business actually eventuated.

The British Army of Occupation is generally very well liked by the Germans, and performs its duties in a most unobtrusive and inoffensive manner. It is nevertheless efficiently vigilant. Wireless apparatus of any kind may not be bought or sold in the occupied area, and on September 18th last a German was fined a sum of approximately £10 by the British Cologne

Court for having in his possession a toy wireless set capable of receiving messages from London.

By special permission, the Telefunken Co. showed a comprehensive display of wireless apparatus and accessories, and demonstrations of broadcast reception were given periodically.

Summing up one's impressions, it may be said that there is at present a heavy handicap to the development of German industries, owing to the lack of money and credit, and the opportunity, therefore, is relatively very favourable for British industries to forge ahead of these potential competitors. When the German handicap is removed, the skill, industry, tenacity, and organising ability of the nation will make them into most formidable competitors in all departments of engineering.

The Monte Grande High-Power Wireless Station "LPZ."

(By A Special Correspondent.)

The site, covering a surface of 580 hectares, upon which the Monte Grande wireless station is constructed is situated 20 km. from the city of Buenos Aires, whence the series of 10 lofty towers can be clearly seen. The transport of the heavy material of which it is built over the soft and stoneless roads of that country proved a serious problem. At first heavy tractors were sent out for the purpose; but they proved too heavy, and in wet weather were altogether useless. Then the "Decauville" light railroad was brought into use, with good results. Over 14 km. of this track was laid, torn up, and re-laid as necessity demanded. From start to finish over 22,000 tons of material was transported from Europe to Argentina, and during the height of the work an average of 55 tons per day was being handled.

The construction rolling-stock comprised over 36 wagons, with four light and two heavy naphtha engines. Stones brought from Tandil, sand carried from the River Plate, and many tons of cement from the capital, together with other material for electrical and mechanical construction, were transported over this frail-looking railroad, of which 8 km. still remains *in situ*, connecting the power-station with the railway at Monte Grande.

The power-house is built on reinforced concrete piles, reaching to three metres above flood-level. The Monte Grande station is intended to communicate with the United States of North America, the European countries, and with South and Central America.

The towers are over 210 metres, say, 680 ft., in height, the two centre towers being 219 metres high; six of them were built by the Telefünken Co., and four by the French C.T.S.F. The distance between the towers is half a kilometre.

The German-built towers weigh 125 tons each, and are supported at four points, in three directions. The load in stormy weather is estimated at 40 tons at the top and 20 tons at the base. The base is supported on eight columns of insulators, each of which is calculated to withstand a load of 80 tons; but the maximum pressure placed upon them in practice is 31 tons. The towers were constructed in pairs, and the average time occupied in erecting each pair was three months.

The foundation of each tower is composed of reinforced concrete, and measures about 3 by 4 by 4 metres.

It is calculated that for each type of tower the wind-strain upon the guys, at the top and without the aerial, is nine tons.

The four French towers are square in section, while the German ones are triangular. Each of the French towers weighs over 85 tons. They are built on a 260-ton foundation, securely attached to piles driven down to bed-rock. These towers are stayed at six places to four points, and are not insulated at the base. The strain upon each guy is about eight tons.

The antenna consists of 32 wires, each 1,270 metres in length. The weight of each is 40 kg., and it is held in tension by a counterbalance of 1,200 kg. The calculated strain over the whole wire is 400 kg.

The earth system consists of 36 kilometres of conductors of various sizes carried upon posts 10 metres above the ground. Ninety-six kilometres of bronze earth-wire is buried in the ground as a counterpoise, and the whole earthing system is tuned within the building by a system of inductances.

Connecting the station with the power sub-station of the Compañia Alemána, at Banfield, is a three-phase cable carrying 1,000 kW at 12,500 volts. Controlling the various elements that constitute the signalling system are two other cables which connect Monte Grande with the Central Office in Buenos Aires and the receiving station in Villa Elisa. The former consists of six-pair cable 27 km. long, containing three pairs "pupinised" for telephone work, and three pairs "non-pupinised" for telegraph work. The cable connecting Villa Elisa with the Central Office consists of twelve pairs, the whole being "pupinised." Monte Grande and Villa Elisa are connected by means of a switchboard in the Central Office. A land-line likewise connects Monte Grande with Villa Elisa, and is used in case of emergency.

In the power-station are two "Telefunken" high-frequency alternators, each driven by a three-phase motor. The alternators deliver a current of 1,000 A at 6,000 cycles and 750 volts.

With the help of these machines a frequency, varying between 11,000 and 44,000, can be obtained, thus giving a wavelength from 27,500 to 6,800 metres. To assist in obtaining these high frequencies, doubling and tripling transformers, coupled to banks of condensers, are used.

The signalling relays are cooled by motor-driven fans, and the condensers are oil-cooled. The doubling and tripling transformers are also oil-cooled by means of a centrifugal pumping system. The oil is kept at a low temperature by means of cooling coils in water-tanks outside the building.

The banks of condensers and inductances are interconnected by means of heavy copper tubes and a five-pole four-throw switch operated by an electric motor. Along the sides of the machinery-hall are placed the many auxiliary motors employed to excite the alternator and frequency transformers, to charge the battery, operate the relays and to drive the blower-motors and oil and water-circulating pumps. The whole of these machines are provided in duplicate.

In the centre of the hall has been placed the control platform, with indicating instruments, whence the engineer in charge can control the whole of the machinery.

The power from Banfield enters the building at 12,500 volts, and is transformed down to 3,200 volts for driving the motors. For lighting, it is transformed down to 230 and 110 volts by a system of transformers. The plant includes two 1,000-kW transformers, 12,500/3,200 volts; two of 75 kW, 3,000/230 volts; one of 150 kW, 3,000/230 volts; one of 30 kW, 1,500/230 volts; and several protecting inductances, as well as numerous small transformers for the measuring instruments.

Alongside of the power-room is a room containing a battery intended for use in emergency. It supplies current, when required, for operating the relays. If the power from the main were to fail, the battery would be automatically switched on to a pilot lighting circuit installed throughout the building.

The Wireless Exhibition.

An All-British Show.

THE All-British Wireless Exhibition was opened at the Royal Albert Hall by Lord Riddell, who was introduced by Mr. W. W. Burnham, chairman of the N.A.R.M., on September 27th, and it will remain open until October 8th. The show has been organised by the National Association of Radio Manufacturers, and the exhibits are claimed to be, without exception, British products. The members of the new retailers' section of the Association will not handle foreign goods, and their aim is to give "service" after purchase. The N.A.R.M. is probably the youngest of the British trade associations, as it has not yet celebrated its second anniversary. Its first public venture was the Shepherd's Bush show in 1923, the present one being the sequel.

The exhibits indicate the improvements made during the last 12 months; a welcome simplification is to be observed, and sets are now much neater and more self-contained. The British Broadcasting Co., Ltd., has equipped a room for the purpose of transmitting from the Albert Hall. This is the first time that the Hall has been used for exhibition purposes; the lighting scheme is by the B.T.-H. Co., the G.E.C., and Metro-Vick Supplies, Ltd., and was carried out by Messrs. Waring and Gillow, Ltd.

A permanent high-power broadcast station to take the place of 5XX—the Chelmsford station, where experiments have been conducted for some months past—is to be erected within the next six months This important announcement was made by Mr. J. C. W. Reith, manager of the B.B.C., at the inaugural luncheon of the Exhibition. The decision, he said, was arrived at only on the previous day. The station, which will have a transmitting power of at least 25 kilowatts, will be erected somewhere south of a line drawn from the Severn to the Wash, probably in the neighbourhood of Northampton, and its wave length will be 1,600 metres.

Metro-Vick Supplies, Ltd.

The most important novelty exhibited by this company is the new "Cosmos Universal" set, types VS5, VS6, and VS7, in various models of cabinet. The set is arranged for reception on all broadcast wave-lengths, the change from one to another being effected simply by changing a single plug-in unit so constructed that it can only be inserted the right way; only three of these units are required to cover wave-lengths from 300 to 3,000 metres. The aerial inductance, h.f. intervalve transformer, and the reaction coil are all changed simultaneously; thus all these coils are always of the most suitable values for whatever wave-length is being received. A feature is that the reaction coil is arranged so that by moving it in one direction from the zero position it is coupled with the aerial inductance, while by moving it in the other direction it is coupled with the h.f. intervalve transformer. Thus the unskilled user can use his reaction coil on the intervalve side without fear of interfering with his neighbours, while the skilled user can react on to the aerial and stations can be searched for with a reaction coupling on to the intervalve

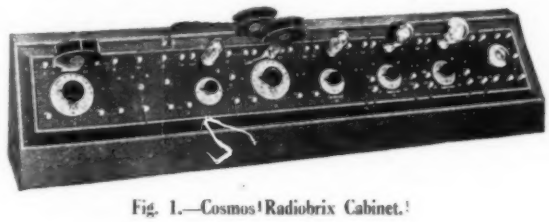

Fig. 1.—Cosmos Radiobrix Cabinet.

circuit, and, when the desired station is tuned in, the reaction coil can be swung over to the aerial inductance. Dual amplification and resistance-capacity coupling are employed throughout.

"Radiobrix" of several new types are shown, including a resistance-capacity coupling unit and a high-frequency choke coupling unit, and also a valve holder which enables a tuned-anode to be used with dual amplification, without the low-frequency coupling between the valves and consequent howling which usually make this impossible. Radiobrix RB.13 is a rejector or "wave-trap," while a new type of cabinet for Radiobrix, fig. 1, in polished mahogany with sloping front has been introduced in which any desired combination can be mounted by the user with no other tool but a screw-driver.

Among new components, special mention may be made of the Polar precision condenser, fig. 2, which has a single moving vane between two fixed vanes faced with mica saturated

Fig. 2.—Metro-Vick Polar Precision Condenser.

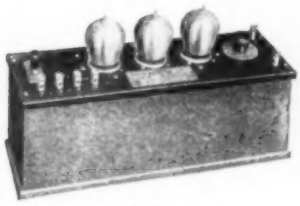

Fig. 3.—Cosmos Note Amplifier.

with a lubricating substance; the moving vane floats on the spindle between two springs very smoothly without overshooting. The condenser occupies small space, can be mounted on a panel by drilling only one hole, and is also supplied on a polished wood base for standing on a table.

Among other novel components may be mentioned the dual or double-wound filament rheostats suitable for use with all types of bright or dull emitter valves, and a special type of adjustable high-frequency transformer.

Radio Instruments, Ltd.

Several models of the portable "Lyrianette" table cabinet are shown by this company. It is a complete receiving installation in a single cabinet, without any external accessories, and includes a standard loud speaker, either the "Claritone" or the new "R.I." model, dull-emitter valves, h.p. and l.p. dry batteries, with aerial and earth terminals at the rear. The "Lyrian" model is similar, but has four valves and a range of wave-lengths from 300 to 4,000 metres, bringing in Continental telephony as well as the British broadcasting. Other standard receivers are fitted with lids and 1, 2, 3, 4 and 5 valves. Specimens of a new loud speaker are shown

Fig. 4.—"RI" Buzzer Wave Meter.

for the first time; it is of the diaphragm type in which the air gap between the poles of the magnet and the diaphragm is made adjustable by a novel method that enables the sensitivity in volume to be regulated. The magnetic circuit comprises two horseshoe magnets of "Cobaltcrom" steel and the pole pieces are built of fine Stalloy laminæ, the whole of the magnetic system being mounted on a solid metal bedplate. The latter is connected by means of springs to two wedge-shaped pieces of metal forming an inclined plane, and so arranged that by means of a fine micrometer screw operated externally the poles of the magnet are moved parallel either towards or away from the diaphragm. Adjustment is so gradual that it can be regulated to a millionth of an inch,

so that the sudden jump when the sensitive point is reached is entirely avoided. The horn is cast from solid aluminium to avoid resonance effects.

A large section of the new "R.I." intervalve-transformer recently described in our pages is being shown on the stand to enable the method of winding to be seen and to indicate how the low self-capacity is obtained. The "buzzer" wave meter, fig. 4, consists of a special variometer with a bank of condensers and a three-way switch for covering the band of wavelengths from 300 to 4,000 metres, and a buzzer mounted on the ebonite panel. The instrument is supplied complete with a coupling coil and three dry batteries all contained in one case.

Components include such things as tuning inductance coils, variable air condensers, fixed condensers, special switches, &c.; high-frequency transformers are made in two wavelength ranges up to 4,000 and 30,000 meters, with or without a tapping switch.

Auto Sundries, Ltd.

This exhibit is confined entirely to "Radiosun" loud speakers, which have been designed by Mr. A. H. Midgley, and are said to be different in principle and construction from all others, the special lip (voiced like an organ pipe) giving pure harmonics free from distortion, and the special construction of the magnet giving volume and sensitivity. The tone appears to be in the room, coming from the mouth of the trumpet, instead of from the base or sound box. A long range of adjustment is provided with no critical position, and one setting only is required for both speech and music. Two models are supplied, namely, the standard horn type for table use and the De Luxe cabinet type in oak and mahogany, while special models are also made in cabinets of true period reproduction.

Edison Swan Electric Co., Ltd.

On this stand are displayed complete sets of the crystal, valve, crystal-valve, and "Constructor's" types, loud speakers of two patterns, accumulators, dry cells, h.p. batteries and valves. One crystal set has provision for the introduction of a loading coil for the reception of 5 XX. The "Toovee" set, introduced last year, is of the reflex type, and the four valve set, fig. 5 is an example of good switching arrangements and loud speaker results. Amongst the components shown are square-law condensers, low- and high-frequency transformers,

Fig. 5.—Edison Swan 4-Valve Receiver.

rheostats, switches, variometers, &c. The two types of loud speaker shown are the "Televox" and "Dulcivox." The former is of the full size pattern, and is provided with what is claimed to be a unique form of adjustment; coarse adjustment is made by screwing one half of the base into the other, final fine adjustment being made by means of a sliding rod which damps the magnetic field. The "Dulcivox" is of the "baby" type, but gives ample volume; the adjustment is made in the usual way by means of a milled head screw. Headphones are also shown, and a noticeable feature on this stand is the fine Chinese lacquer finish on some of the instruments.

General Electric Co., Ltd.

In addition to a complete range of "Gecophone" crystal and valve receiving sets, amplifiers, loud speakers and components, the G.E.C. is exhibiting an entirely new range of sets produced in various styles. The single-valve set has the conventional reaction circuit, tuning being effected by a variable condenser in parallel with a fixed inductance, and variable coupling between the reaction coil and the inductance is provided. A simple vernier condenser is provided for fine tuning; the standard set allows for tuning between 300 and 500 metres, with standard P.O. aerial, but sockets are provided at the front of the instrument in the aerial and reaction circuits for the insertion of loading coils for longer wave-lengths. This set is made up in the flat form with vertical ebonite panel, and the connections are made by plugs and sockets at the back of the set. The two-valve set, comprising a detector and one stage of low-frequency amplification, is made in two forms, one a flat type with horizontal panel, and the other a cabinet very similar in appearance to the original "Gecophone." A useful provision is a separate terminal for increasing the high-pressure voltage applied to the low-frequency valve, which can thus be used as a power amplifier. Provision is also made for inserting grid cells to provide the necessary negative bias for the grid of the low-frequency valve. The three-valve set is similar to the two-valve set, but comprises two stages of low-frequency amplification. It is made in a flat form with vertical panel as illustrated in fig. 6 and also in a cabinet form in a mahogany case with double hinged doors, and a drawer beneath to accommodate the battery.

One- and two-valve amplifiers for use with existing sets are also exhibited, together with loud speakers. For a new inter-

Fig. 6.—New G.E.C. Three-Valve Set.

valve transformer is claimed distortionless magnification over the whole audio-frequency range, and a neat form of vernier condenser takes up the minimum of space and may be conveniently added to any existing set.

Mullard Radio Valve Co., Ltd.

Amongst a multitude of valves of all sizes and types, including silica models, an innovation is the "Safety Disk," samples of which are being given away on the firm's stand. It has been the experience of this company that the major proportion of valve-filament burn-outs are due to accidental application of the h.p. voltage to the filament pins. The device has therefore been designed to prevent the filament pins touching any metal in the valve holder until actually in contact with the filament supply sockets, when, of course, they are safely home. A disk of coloured insulating material is backed by a layer of adhesive substance which will attach the disk firmly and permanently to the valve holder. The disk has four holes punched through it which register with the positions of the valve pins and are of sufficient diameter to allow the pins to pass freely through the disk. The disk is supplied lightly attached to a linen surface; it is necessary only to strip it from the linen, place the disk on top of the valve holder, taking care that the holes are correctly placed relatively to the sockets, and apply firm pressure between the adhesive surface and the ebonite of the holder or panel. It is impossible to insert the valve in the holder unless the filament pins are in their correct and safe position, while the insulation of the device and the set is in no way affected.

(To be continued.)

A Japanese "All-Electric" Home.—Japan has made noteworthy progress in the harnessing of its water power for the production of electrical energy, which, in addition to aiding Japan industrially, has produced a decided tendency on the part of the Japanese to use electrical household appliances. In order to develop more rapidly this field of merchandising, a committee of men representing interested business concerns has acquired land in a suburb of Tokio on which an electric home has been erected. The house is of two stories, having one half of the rooms furnished according to Japanese methods and the other half in accordance with present-day Western ideas. The most modern electric light fixtures will be installed throughout the building, combined with electric fans, portable lamps, and a completely equipped electric kitchen. The house was to be opened to the public on September 15th.—*Commerce Reports.*

An Electric Piano.—In the *Journal* of the Royal Society of Arts for September 12th an account is given of an electric piano, invented by Messrs. Martin & Maitre, of Rouen, which combines the advantages of the stricken wire with those of the bowed string. Close to each steel wire is a little electro-magnet, which, when energised, sets it in vibration, with a very pure tone. If the player continues to press the key, the wire, with the aid of a small mechanism controlled by a tuning fork, is kept in vibration as long as may be desired. The ordinary hammer movement is retained, for use at will, and thus the player can produce the effect of the piano with the hammers only; or of the organ, with the electric system only; or of the flute or oboe, with the combination of both. Thus some approach can be made to the effect of an orchestra, and composers can estimate the merits of orchestration when they are engaged upon it.

The Electric Carnival.

The Carnival recently held at the British Empire Exhibition afforded an opportunity for E.D.A. to exercise its ingenuity in the concoction of slogans proclaiming the virtues of the electric way, and we are indebted to the Director, Mr. J. W. Beauchamp, for some photographs which we reproduce, illustrating the Association's efforts to turn the occasion to good account.

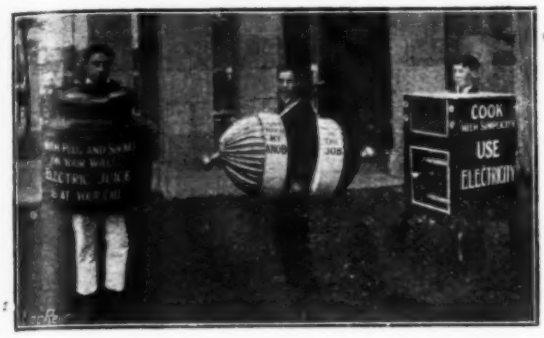

Fig. 1.

Figs. 1 and 2 show some of the moving sights for which the property staff of E.D.A. was responsible; the human element is doubling its parts only for the purpose of the photographs, as even electrical men cannot be in two places at once. One of the best slogans is: "Cook with simplicity—use electricity," and a good second is: "Of morning tea I sing to thee." These two have the catching rhythm and aptness of expression that mark a good slogan. The others may speak for themselves.

Fig. 3 shows the E.D.A. lorry, with "Miss Electricity" on her throne, and her minions in attendance—a dramatic composition in which the only discordant element is the meter reader with his big meter. We must admire the courage with which E.D.A. boldly exhibits this item, even if we regard it as indiscreet; probably the small amount of energy recorded on its dial was the subject of propaganda, but anyhow, no matter how small the bill, we should not be disposed to "feature" it!

Fig. 2.

As previously mentioned, "Miss Electricity" was impersonated by Miss S. P. Gillott, the daughter of Mr. W. A. Gillott, chairman of the Carnival Committee, whose efforts were ably seconded by Mr. Gibson Young.

To other exhibits in the procession we have already referred; unfortunately such illustrations of them as were available were unsuitable for reproduction.

Tapping Switches for Transformers.

By H. P.

During the whole history of the static transformer, tappings have been used for small adjustments of voltage.

In the early days, considerable attention was devoted by engineers to the design of a tapping switch which would enable tappings to be altered without removing the cover of the transformer tank and undoing nuts and bolts to change the links then fitted, a procedure which frequently resulted in nuts being dropped into the tank or sections of winding short-circuited.

The form of switch then employed was simply an adaptation of the face-plate rotor starting switch. Transformers on which these were used were of small capacities and for low-voltage circuits. The tappings were brought out at the end of the star-connected secondary winding, and the rotor switch arm formed the neutral point. It was found that while this arrangement was perfectly satisfactory for the small transformers then in use, it was unsuited for large transformers, especially with the higher voltages that were being adopted. There were two serious objections to the use of this switch for large transformers. When tapping leads were brought out at the ends of the windings on a large transformer, there was frequently serious magnetic unbalancing when the lower-voltage tappings were in use. In addition to this, the secondary currents became too large for such a switch to handle. The employment of this type of switch on the high-pressure side was, of course, altogether out of the question, and so its use was abandoned.

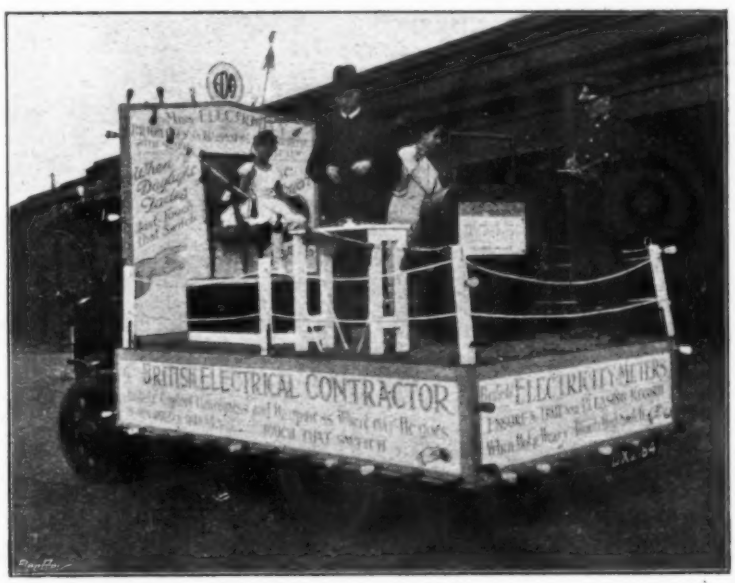

Fig. 3.

Recently this question has again become prominent, and most transformer makers, both here and abroad, have again taken up the design of tapping switches to deal with the plus and minus 2½ and 5 per cent. regulating tappings on the high-pressure side of the transformer. These switches are usually mounted on the transformer and, of course, are in the same tank. Up to the present, none of the switches put on the market is capable of changing tappings under load. It must be remembered that a high-pressure a.c. circuit can only be broken safely on an oil switch and, therefore, a switch not designed to break the circuit under load must be interlocked with the main oil switch to avoid disasters.

If tappings are to be changed without breaking circuit, a shunting resistance or choking coil between contacts is essential in the design of the switch, the latter being preferably of the drum controller type. The design of such a switch is perfectly feasible, and has indeed been accomplished, but it cannot be considered a sound

commercial proposition. A switch to change the plus and minus 2½ and 5 per cent. tappings on a 500-kVA, 3-phase, 6,600-volt, 50-cycle transformer on load would cost to-day at least £150. This is approximately one-third of the cost of the transformer with which it would be used. A similar switch for a smaller transformer would cost as much, since the mechanical strength and insulation necessary do not permit any reduction in size to be made. Then again the frequent operation of this switch, if mounted in the transformer tank, would tend to sludge the oil, and the sludge deposits would naturally find their way on to the transformer windings. But as a rule the tappings on a transformer are changed very infrequently, and the advantages gained by the use of the switch would rarely be worth such a large extra expenditure and the risk of deteriorating the oil. There are now several designs of tapping boards which are absolutely mistake-proof, and with which no nuts have to be entirely removed; the actual change of the tappings need occupy no more than a couple of minutes. Such boards are now supplied as standard by the majority of transformer manufacturers.

It therefore seems that to specify a tapping switch if the tappings are not changed every day (which is seldom required) is to spend money out of proportion to the very slight convenience obtained. Engineers would be better advised to use a simple and mistake-proof arrangement of tapping board in preference to a complicated and expensive tapping switch whose repeated use is bound to deteriorate the oil.

Marconi-Osram Thermionic Valves.

A Visit to the Works of the M.O. Valve Co., Ltd.

Radio communication has been practised on a commercial basis for over 25 years, the key to its swift growth, and particularly of broadcast telephony in recent years, being undoubtedly the thermionic valve, the development of which has resulted from close co-operation between those engaged upon the manufacture of valves and those concerned with their application.

It was therefore quite evident to those who were recently privileged to visit the Osram Lamp Works at Hammersmith that the manufacture of such valves on the scale there seen

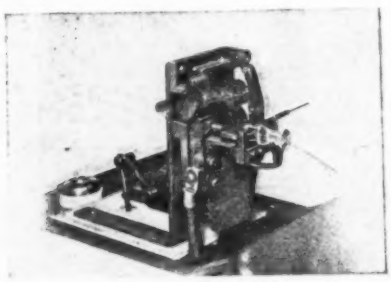

Fig. 1.—Grid-making Machine.

would not be possible without the valuable preliminary work carried out at, and the constant assistance of, both the G.E.C. Research Laboratories at Wembley and the Marconi Works at Chelmsford. At first each organisation proceeded along its own lines; the experience of both, however, is now combined to the advantage of the M.O. Valve Co., Ltd., a separate manufacturing organisation with a specialised factory at the Osram Lamp Works, the products being marketed by the General Electric Co., Ltd., and the Marconiphone Co., Ltd., as joint selling concerns.

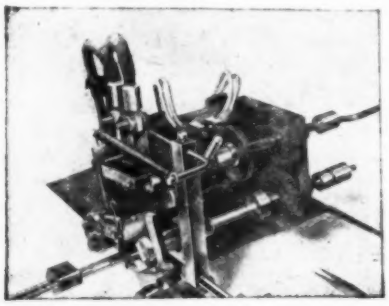

Fig. 2.—Spot-welding Apparatus for Assembly.

The problems met with in valve manufacture include many of those involved in the production of electric lamps. The raw materials—glass and tungsten wire—are the same in both instances, and many of the essential processes, such as seal-making, exhausting, &c., although more complicated, are very similar.

To follow the processes of manufacture of the smaller types of valve used for broadcast reception we will take as an example the D.E.3, a dull-emitter general purpose valve, the filament of which is rated to consume only about 0.06 ampere at 2.8 volts. In view of the extreme fineness of the filament and the very small clearances between filament, grid, and plate, this valve affords an interesting example of the skill of the operatives employed, and of the ingenuity of the machines specially designed and manufactured within the factory for this work. The majority of the operatives are girls, some of whom earn wages considerably higher than those paid to skilled fitters and mechanics.

The preliminary operations result in the production of the "pinch" or "seal"; a short length of glass tube, one end of which is expanded to form a bell mouth, is clamped in

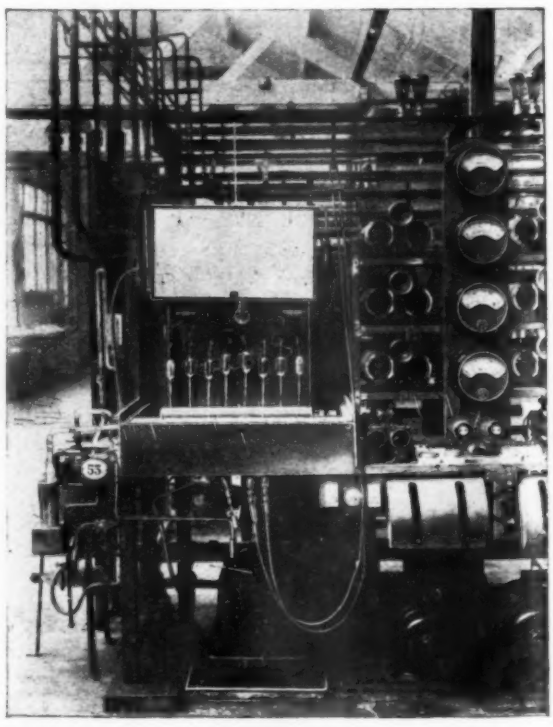

Fig. 3.—Pump Tables and Eddy-Current Heating Equipment.

a machine and through the tube are threaded four copper "leading-in" wires, to one end of each of which is attached a short length of special wire and then a short piece of thicker wire, ultimately to become the supports for the filament, grid, and plate. As soon as the wires are placed in position, the tube begins to revolve, and a number of gas blow-lamp flames play upon the unflanged end. When the glass has become thoroughly softened, two arms rise up and squeeze it flat, tightly gripping the "leading-in" wires and forming an air-tight seal; the four supporting wires are next bent to the correct shape according to the type of valve to be made.

In certain cases, such as the D.E.3 valve having a vertical

filament, grid, and plate, an extension of the supporting system is added at this stage, consisting of top supports for the grid, plate, and filament, joined into a rigid unit, and insulated from each other by being sealed into a glass bead. This upper unit is attached to the lower portion by spot-welding the bottom of the upper filament support to one of the short filament supports.

In another portion of the works, girls prepare grids, plates, and filaments ready for mounting upon their supports. The grids are principally made upon a universal machine, fig. 1, in which the necessary number of turns of wire, correctly spaced, are wound on a mandrel and spot-welded at every turn to the supporting wire; by substituting formers of various shapes, these machines may be used for any type of grid, and a recently developed one is entirely automatic. The cylindrical or flat plates are bent to shape on formers, the joint being spot-welded; a longitudinal rib or support is

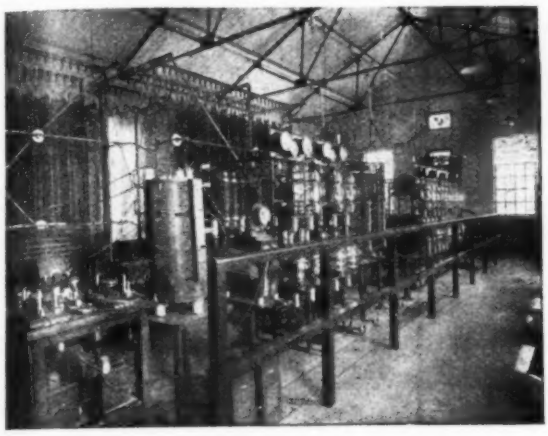

Fig. 4.—Ongar, Essex, Transmitting Valves.

also spot-welded on, as well as a short length of magnesium wire.

The assembly of these components calls for accuracy and delicacy of touch. Jigs are extensively used, and a typical machine is shown in fig. 2. In the case of the D.E.3 valve, the grid and plate are fitted before the filament is inserted, both parts being slipped on to a mandrel and welded at the top and bottom to the supports. The next process consists of inserting the seal, with its filament, plate, and grid into a bulb, to the top end of which has been attached a short glass tube through which the air will ultimately be exhausted. This process is performed on a machine, the seal and bulb revolving and their point of junction being heated by gas flames until the two pieces of glass fuse together; the

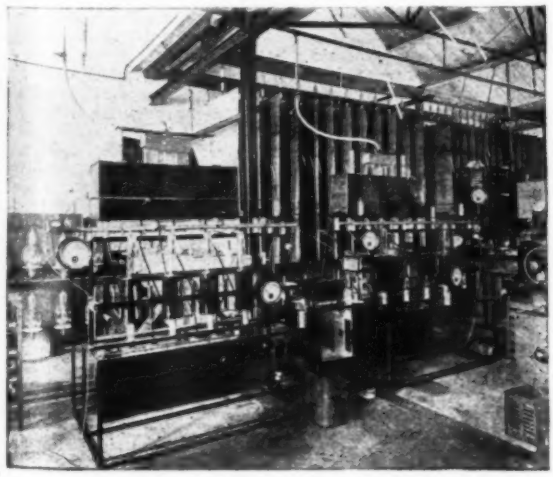

Fig. 5.—Water-cooled Valves at 5XX, Chelmsford.

excess portion of the neck, which drops by its own weight, is finally parted by a finely-pointed flame.

Many valves are now being pumped on automatic machines. In order to drive off as much as possible of the gas occluded by the metal parts of the valve and the inner surface of the bulb, it is necessary to raise the plate to a very high temperature, when the small piece of magnesium, previously mentioned as having been welded to the plate, volatilises, some of it combining with the small amount of gas remaining, and thus "cleaning" the vacuum, the remainder being deposited as a fine mirror-like coating upon the inner surface of the glass, thus presenting a surface which will offer no hospitality to unwanted gas, and will also absorb any gas which may be liberated from the metal parts during the life of the valve. Several methods of "flashing the magnesium getter" are adopted; in the case of D.E.3 valves it is eddy-current heating. A coil of copper wire, through which a high-pressure very-high-frequency current can be made to flow is slipped over the bulb of the valve. The closing of the pump cage doors automatically switches on the high-frequency current, and in a few seconds the eddy currents induced in the plate raise the metal to a high temperature; pump tables with eddy-current heating equipment are shown in fig. 3. Exhausting being completed, the lamps are sealed off ready for the final processes. Dull-emitter valves have filaments of tungsten wire in which is a certain amount of thoria to give a large electron emission at a comparatively low temperature. In order to bring a large quantity of the thoria to the surface of the filament, the valve is burned for a certain period at a definite temperature considerably in excess of the normal. The filament is next "aged" by burning at its rated temperature for a certain time, after which it is ready for the final tests.

Nearly two dozen standard types of small valves for broadcast reception and low-power transmission are listed, besides special types for the army, navy, air force, post office, and other services. In addition, the manufacture of high-power rectifying and transmitting valves is undertaken at Hammersmith, including large G.E.C. rectifiers capable of dealing with small currents at 150,000 volts, such as are necessary for cable testing, the electrical precipitation of dust, and other processes. Fig. 4 illustrates h.p. transmitting valves in use at the Marconi transatlantic radio telegraph station at Ongar, Essex, for communicating with Canada. Large water-cooled transmitting valves are also built in sizes taking an input of from 10 to 20 kW. The high-power broadcasting station at Chelmsford, 5XX, a photograph of which is reproduced in fig. 5, is equipped with such valves.

Legal.

Johnson Jorgensen Flint Glass, Ltd., v. Hudson Shead and Towell, Ltd.

In the Mayor's and City of London Court, on September 24th, before Judge Shewell Cooper, Johnson Jorgensen Flint Glass, Ltd., sued Messrs. Hudson Shead & Towell, Ltd., electric light fitters, for £7 10s. for goods supplied. Mr. H. Strouts, for the plaintiffs, said that the defendants ordered four 24-in. white opal bowls from the plaintiffs at 25s. each, in July, 1923. Six bowls were delivered in January last, but the defendants had refused to pay. For the defence it was stated that the bowls were not as ordered. When they were fitted and the light was switched on, green patches were visible on them. Moreover, they only ordered four, and the plaintiffs had delivered six. A salesman in the employment of the plaintiffs alleged that it was the custom of the trade that when goods had to be made specially to an order, any reasonable number beyond those ordered should be accepted. Defendants' representative said that if the bowls had been white opal bowls, the six would have been accepted, but the discoloration was such that they felt that they were entitled to reject them. Judge Shewell Cooper gave judgment for the defendants, with costs, stating that from the evidence he came to the conclusion that the order was not properly fulfilled.

Electricity Committee Chairman Fined.

At Chatham, on September 23rd, David Ritson, a retired engineer lieut.-commander, and chairman of the Gillingham Electricity Committee, was charged with fraudulently abstracting and using electricity from the Gillingham Town Council's mains. The prosecution stated that the wiring in the defendant's residence was so arranged that only the upper floor was supplied with electricity through a meter; the supply to the ground floor came straight from the mains. The charge covered a period of three years, and the value of the electricity unlawfully consumed was put at £16.

The defendant denied that he had ever tampered with the wiring, but his son admitted having put in a heating circuit in the lower rooms, which, later, it was decided not to use, and no meter was fitted.

The Bench imposed a fine of £50.

Cable-Stealing Charge.

David Barry, a labourer, who pleaded guilty at Greenock to a charge of having, while acting in concert with another man, stolen 122 yards of electric cable from the Giffnock sub-station of the Clyde Valley Electrical Power Co., was sentenced to three months' imprisonment on September 25th.

E

Intensive Lighting Development.

The first of the 1924-25 series of salesmanship conferences organised by the British Electrical Development Association was held in the Lighting Demonstration Department of the Electric Lamp Manufacturers' Association, London, on September 26th.

Mr. W. C. P. Tapper (President of the I.M.E.A.) was in the chair, and in opening the proceedings, he said that Dr. Ferranti and others had recently emphasised the backward condition of the electricity supply industry in this country as compared with that in other countries. That was not entirely due to defects in the industry. Coal and gas had been cheap and this made it difficult for the industry to advance as quickly as it had, perhaps, in other countries, but the E.D.A. was doing all that was possible to bring electricity before the public. Lighting was the oldest service which the electricity supply industry had to give to the public, but it needed the stimulus of modern development to be applied to it, and the time and thought given to the subject would be very well repaid in increased sales and increased satisfaction among consumers. After pointing out the importance of the salesmanship conferences and of the attendances being as representative as possible, the Chairman commended the E.D.A. exhibit at Wembley.

The subject of the debate for the evening was "A Programme for Intensive Lighting Development," which was opened by Mr. W. E. Bush, of the Electric Lamp Manufacturers' Association. Mr. Bush contended that there must be complete co-operation between all sections of the industry—contractors, supply authorities and manufacturers—so that a persistent national campaign might be carried on. He deprecated isolated effort and also simultaneous efforts by various people all with the same object, but overlapping and causing confusion. He suggested that in each district there should be appointed committees consisting of contractors, supply authorities and manufacturers, to make arrangements for electric homes in which there would be qualified assistants to demonstrate to the public; more would be achieved by demonstrations than by "literature" alone. These electric home exhibitions should not be continued in any district for more than two or three weeks at a time, otherwise the novelty would wear off. It was suggested that an enterprising local builder would be willing to loan a new house for the purpose, and that furnishing firms will be found willing to furnish such an exhibition subject, of course, to due acknowledgement. The committees should also prepare statistics analysing the market to be exploited. Thus, the existing standards of lighting would be compared with modern recommended standards and these comparisons placed before consumers, whilst information should be prepared upon such subjects as the relation of illumination to output, the attracting power of light in windows and so on, because the object was to pass from the lighting to the industrial load. Another useful departure would be the issue of handbooks of information to assist architects, contractors and others; it was noteworthy that such handbooks would shortly be issued by the Electric Lamp Manufacturers' Association.

With regard to the cost of wiring, Mr. Bush thought that a hire-purchase or even a hire system should be arranged between the contractors and the supply authorities. The present diversity of charges for electric lighting should be abolished and a simple graduated scale which would have regard to increased demand introduced. It was suggested that illumination design courses should be established for salesmen as an alternative to relying solely upon printed matter. The enormous value of the field to be covered was emphasised by the statement that the potential lighting market in the country has been put at £400,000,000, excluding the annual revenue to be derived from the sale of energy or in providing the necessary generating and other plant. Moreover, to modernise existing lighting installations would cost something like £50,000,000 whilst the equipment involved in this reconstruction would have a value of £5,000,000, *i.e.*, fittings, &c., as distinct from the wiring work. From the point of view of central station economics there was no reason why the lighting load should not be developed just as much as the heating and cooking load. The lighting peak, unsatisfactory as it might be as an engineering performance, did pay dividends and the more it was developed, the more it would produce; it was a most powerful creative and development agent.

In the ensuing discussion, Mr. W. R. Rawlings said that bad shop-window lighting was due to ignorance, and he emphasised that a naked light was not attractive. There were considerable difficulties in effecting co-operation, both as between contractors and supply authorities, and between brother contractors. He urged strongly the need for supplying current to contractors at reduced prices. They could not afford to light their showrooms to the degree demonstrated by Mr. Bush, owing to the cost of current, but if the authorities would supply at ¼d. per kWh, they would make a good display in every showroom in London.

Mr. C. W. Sully stressed the importance of national sales campaigns, because they provided an opportunity of creating the atmosphere which was necessary when endeavouring to effect a sale. Want of co-operation led to the creation by individuals of diverse currents which counteracted each other.

Mr. G. Campbell (Benjamin Electric, Ltd.), said that one great point which had been brought out by the paper was the value of demonstration. He also urged that those endeavouring to sell electric lighting should ensure that the lighting of their own offices and works was carried out properly.

Mr. H. F. Simon said that co-operation between supply authorities and contractors was particularly necessary in the improvement of factory lighting. He suggested that supply authorities might engage lighting experts to accompany meter readers on their periodical visits, make notes of those which required improvement, and then communicate the facts to enterprising contractors in the district.

Mr. J. W. Beauchamp said that the business resulting from a good display of lighting was such that it would pay contractors to give good displays with electricity at the normal rates. The public would not be very much impressed if they got to know that a contractor was using cheap current. Mr. Beauchamp agreed that subdued lighting was demanded in the home, but that difficulty could be met by combining lighting with art and decoration.

Mr. H. F. Shears (Hackney) illustrated the value of demonstration by referring to the success achieved by the E.L.M.A. Demonstration Department.

Mr. S. M. Hills said that cost was of secondary importance as compared with the value of electric lighting. He also deprecated the lack of co-operation between contractors, because, when quoting for a particular job, they were apt to include in the estimate inferior articles rather than the best, for fear of being under-quoted by competitors.

Mr. L. E. Buckell (G.E.C.), said that rather than try to show that electricity was so cheap that a man could afford to use it, they should show him that it was so good that he could not do without it. Lighting could be demonstrated much better than power and heating, because the effect could be seen without calculations. Artistic rather than dim lighting, was required for the home, and he urged the value of coloured lighting in this respect. The lighting load was not so bad as it was sometimes believed to be, and in certain districts lighting itself could give a day load factor of as much as 15 per cent. Mr. Buckell emphasised the value of carrying out wiring on the extended payment system; this would be helped considerably if bills were rendered monthly instead of quarterly, because the instalments would be smaller.

Mr. L. L. Robinson said the retort to the demand for cheap current for contractors was that he was not prepared to supply to them at ¼d. per kWh in a general way, but would do so to a contractor who was prepared to spend £5,000 on a showroom in a main street in Hackney. The trouble was that contractors were generally too small for this big business, and it would be an advantage if they combined into limited liability companies and could take a long view. He agreed that lighting could be made an economic load, and that it was valuable to the central station.

Mr. F. G. Gilbertson (Walthamstow) emphasised the value of demonstration, co-operation between contractors and supply authorities, and a popular price for electricity.

Mr. H. T. Young (Messrs. Troughton & Young), said that what was wanted more than anything among salesmen was a greater amount of conviction and a greater knowledge of the possibilities of electric lighting. This led him to appeal for the holding of concentrated courses of instruction in all towns, not only for salesmen, but also for those who did repair work and came into direct contact with consumers.

Mr. W. E. Warrilow said that the price was of secondary importance compared with the quality of the illuminant and its unique character.

Mr. Bush, in reply, referred to the objection which some people had to working under artificial light, and said that if artificial light were used in sufficient quantity, and intelligently, without glare, it was as good as daylight for working purposes. He did not regard the supply of current to contractors at special rates as an essential. The energy used by the E.L.M.A. in the Demonstration Department was not supplied at a special rate, though he admitted that that was not for want of trying. When talking of improving the standard of lighting, he agreed that they had rather left out the domestic field, but, even if they did not sell the *quantity* of illumination in the home, there was room for improvement. The sale of all kinds of domestic appliances was handicapped by the fact that there were so few wall plugs in modern houses, and a national campaign on wall plugs would be a great benefit. Visitors to the E.L.M.A. Demonstration Department were so impressed that little consideration was given to the actual cost. Each district should have a very attractive shop window as a model of what electricity could do. The problem of arranging courses on illumination had been considered by the E.L.M.A., but it could not go to the expense of arranging elaborate sales schools if contractors and supply authorities did not send representatives; as soon as these did their part, the E.L.M.A. would go ahead. The E.L.M.A. was also making arrangements to start a national scheme for development, and he appealed for help in this direction also from the other sections of the industry.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "Garnite" Commutator Slotter.

MESSRS. COLLINS ELECTRICAL, LTD., 115, Clerkenwell Road, E.C.1, have sent us one of their "Garnite" tools (fig. 1) for reducing the mica separation in commutators. This consists of a galvanised iron bar, at each end of which is a hand grip. The centre is curved to a long radius, and upon this are mounted a guide blade, a cutting saw, and a guide saddle. The guide blade is given about an inch "play" by means of a slot and tightening bolt. The holder of the cutting saw is fixed in position by two adjustable set screws. Fine adjustment is made by a wing bolt, and spring washers beneath the heads of the set screws take this up. The saddle is U-shaped and is tightened in position by a bolt and wing nut.

Fig. 1.—The "Garnite" Commutator Slotter.

In operation, two slots are first cleared, as the two blades have a pair of segments between them, to act as guides. After each slot is cleared the saw blade is raised, and one blade can be used for from 50 to 80 slots. If the tool is properly adjusted the work can be done very smoothly, with a minimum of effort.

A New Street-Lighting Refractor.

A considerable advance in street lighting is made by a new type of prismatic refractor produced by HOLOPHANE, LTD., 8, Elverton Street, Vincent Square, S.W.1. In the earlier designs of Holophane refractors, the main beam, which was inclined at an angle of 75 deg. from the vertical, was distributed symmetrically all round the unit, and a great deal of the illumination was practically wasted. In the new pattern (fig. 2) the prisms have been specially designed to divert the side illumination to augment the beams up and down the street. It is claimed that the candle-power of the beams thus obtained is over 12 times the rated candle-power

Fig. 2.—New "Holophane" Refractor.

of the lamp employed. The effect is clearly shown in figs. 3 and 4, which are respectively distribution curves in the vertical and horizontal planes. The new refractor is primarily meant for use in comparatively narrow streets, not exceeding 80 ft. in width. Three sizes and three types are made, and these complete the range of prismatic refractors made by the company for all conditions of modern street lighting.

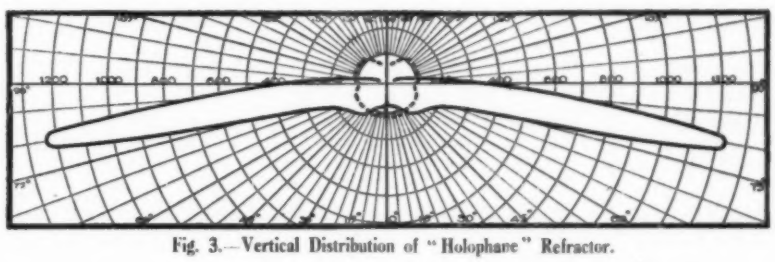

Fig. 3.—Vertical Distribution of "Holophane" Refractor.

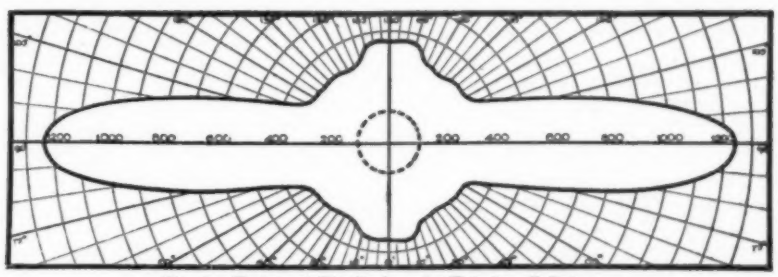

Fig. 4.—Horizontal Distribution of "Holophane" Refractor.

The "Memette" Switch.

The latest production of the MIDLAND ELECTRIC MANUFACTURING CO., LTD., Bradford Street, Birmingham, is the "Memette" switch and fuse combination illustrated in fig. 5. It is of very small dimensions, measuring only 6 in. by 4¾ in. by 2¾ in. The d.p. switch movement consists of hard-drawn h.c. copper blades mounted on a steel shaft of square section

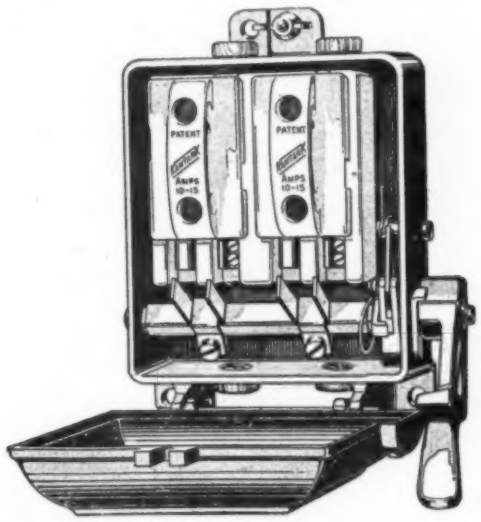

Fig. 5.—The "Memette" Switch.

with bakelite insulation. The construction is such as to guard against any distortion. A quick-make and quick-break movement is incorporated in the switch. The bearings are steel and cast-iron on brass, and the springs are of natural steel. The two fuses are of the well-known "Kantark" pattern, and the apparatus is enclosed in a grey cast-iron case finished in black enamel.

Although the gear is rated at 15 A, 250 V, in tests carried out at the Birmingham University Electrical Laboratory, a sample satisfactorily "broke" a current of 200 A at the rated voltage, and currents of 25 A at 375 V and 15 A at 440 V. The temperature rise at the rated load was found to be 26 deg. F., whereas the maximum allowable is 36 deg. A 2,500-V flash test revealed no fault.

Correspondence.

***Correspondents should forward their communications* at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Brown, Boveri & Co.'s Report.

We notice on page 442 of your current issue what purports to be an abstract of the recently published annual report of Brown, Boveri & Co., Switzerland, and beg to draw your attention to the fact that this abstract contains several serious inaccuracies and mis-statements of fact.

For example, whereas the Scintilla Company is an entirely separate and distinct organisation, *manufacturing magnetos in Solothurn*, the impression is conveyed that it is part and parcel of the Brown, Boveri organisation and works. Again, the very harmful statement is made that "the new buildings at Baden are to be shut down, and the manufacture of electrical apparatus of the Brown, Boveri Company is for the most part to be transferred to the works of the 'Scintilla.'"

Where your translator got this from we do not know, as it is exactly contrary to the facts stated in the report. No new buildings are being shut down at Baden, the position being that the transfer of the manufacture of switchgear to Solothurn makes it possible to avoid the erection of new buildings at Baden which would otherwise be necessary.

As the statements above referred to are calculated to do our interests and those of our Swiss company considerable harm, we should be obliged if you would correct them at the first opportunity.

Brown, Boveri & Co., Ltd.,
O. D. Wale, *Secretary.*

London, *September 22nd*, 1924.

[We regret that annoyance has been caused to our correspondents by the abstract referred to in their letter. Whether the Scintilla Company is or is not "part and parcel of the Brown, Boveri organisation and works" may be judged from the fact that Messrs. Brown, Boveri & Co., as stated above, are using the Scintilla works for the manufacture of their switchgear, and thus avoiding the erection of new buildings at Baden. We reprint below an extract from the *Frankfurter Zeitung* of September 11th, from which readers of German will be able to see for themselves that our version closely follows the original. In the light of the unabridged report, however, for the loan of which we are indebted to our correspondents, it is made clear that the "new buildings" mentioned have not actually been erected, and therefore the word "unterlassen" should not have been rendered "shut down," but "dispensed with." The newspaper text gave no precise indication on this point. Whilst expressing regret for this slip, we fail to see any other material error in our report, whether it be compared with the original or with the newspaper abstract. Neither version indicates that the words "elektrischer Apparate" relate only to switchgear.—Eds. Elec. Rev.]

"Jetzt soll bei der 'Scintilla' die Herstellung von Magnetapparaten eingeschränkt werden, andererseits soll der Neubau in Baden unterlassen und die Fabrikation elektrischer Apparate der A.-G. Brown, Boveri & Cie. zum grösseren Teil in die Fabrik der 'Scintilla' verlegt werden. Da für die bisherige Fabrikation der 'Scintilla' eine Rentabilität kaum mehr zu erwarten sei, mues die A.-G. Brown, Boveri & Cie. ihr gesamtes Guthaben, soweit es nicht durch Immobilien usw. gedeckt erscheint, abschreiben, wozu Fr. 7 Mill. nötig sind."

Automobile Radiator Heater.

In view of the approach of the cold winter nights and consequent great difficulty in starting one's car in the morning, I would like to suggest that some of the larger electrical firms might place on the market an "immersion heater" which might conceivably be run off the battery.

"Radiator."

Colchester, *September 25th*, 1924.

[This has already been done. Apart from a number of ordinary-type immersion heaters which may be used for the purpose indicated, Messrs. Drake & Gorham Wholesale, Ltd., and the Midland Electric Power Installation Co., Ltd. (and, no doubt, other firms) make special forms of heaters for use in radiators.—Eds. Elec. Rev.]

Three-phase Motors.

Few who follow the statements and publications of Dr. T. F. Wall will have the temerity to challenge them. Led by the E.D.A., the season has now opened when the seeker after knowledge and enlightenment is permitted to express his views in public, and I trust with the approval of the Editors of the good old Electrical Review, like "Pelican" in the "Correspondence" columns of the Electrical Review for September 26th, I may be permitted to join in.

"Pelican's" reference to ball bearings will, I trust, produce some enlightening correspondence. Personally, I am still unconvinced as to the economic advantage thereof, apart from the admitted initial elimination of appreciable friction losses in the bearings.

How about the ultimate maintenance costs? The renewal of a sleeve bearing bush for ring lubrication is a comparatively simple and cheap process. A good modern ball or roller bearing will ensure satisfactory service for a lengthy period, but not so in respect of many of the equipments which are reaching this country from the continent. Some British motor makers are to-day supplying a.c. motors with ball bearings of good English make, and I understand claim that lubrication can be neglected for two years at normal temperatures. Last night, at the Machine Tool Exhibition, I was advised that the period should be variously six months to one year. Who is correct? An actual experience I have had with ball-bearing motors works out as follows:—

Some 10 or 12 years back a batch of 5-h.p. polyphase motors, emanated from a first-class firm situated within easy smelling distance of the Manchester Ship Canal. The motors gave excellent service until about 1922, when for reasons in no sense associated with the "ozone" of the aforesaid canal, serious trouble arose, which first showed up as bearing trouble only. In the intervening period, oil only had been used as a lubricant for these slip-ring variable-speed motors. Investigation gave the following results and facts:—

1.—The stators were wound with two d.c.c. conductors in parallel per coil, per phase.

2.—Vibration had taken place. The ball-bearing housing bracket had chattered in its seating in the motor end shield. I had to re-bore and bush the c.i. end shield orifice. The ball-race was O.K.

3.—The aforesaid vibration, plus frequent starting shocks, had apparently fractured one of the two conductors forming the parallel of each phase coil, thus leaving one conductor only to do the duty of two normally in parallel. Of course a burn-out failure occurred in the most inaccessible coil, at the bottom of a slot, the initial fracture being adjacent to the iron lamination on the longer side of a basket coil. The resultant burn-out necessitated the complete rewinding of the stator.

I submit that if sleeve-bearing bushes had been used the inspection of the air gap which had been carried out would probably have brought the defect to the notice of those responsible while the fault was in an incipient state.

I am not altogether in agreement with "Pelican" in his condemnation of auto-transformer starters, and his preference for star-delta starters and, presumably, the series-parallel equivalent for two-phase motors. This point at once brings me to that illuminating correspondence which appeared last year in the Electrical Review on "Squirrel-Cage *v.* Slip-Ring Motors." I will say at once that my experience of closed rotor polyphase motors, deriving energy from a public supply source, does not exceed units of more than 120 h.p. It is common knowledge that torque is dependent upon the square of the impressed voltage. That being so, how does "Pelican" get more than $1/1.73^2$, say 35 per cent. of full-load torque? Even so he draws approximately 170 per cent. of full-load current from the line, and consequent jars on the stator windings tending to fracture them.

Admittedly auto-transformer starters tend to adversely affect the power factor. But a 40 per cent. tap on an auto-starter will keep the starting current down to 80 or 90 per cent. of full load, which corresponds to a torque in the neighbourhood of 15 to 20 per cent., which is sufficient usually to start the motor on a loose pulley equipment, which I contend should always form part of the essential equipment of all squirrel-cage motor installations. You can usually arrange for various taps on an auto-starter consequent upon limitations of supply and necessary torque, &c.

Except as a salesman's talking point ½ per cent. efficiency does not matter. Amperes, broadly speaking, are what concern the supply and installation men, and there hangs a whole book on that vexed question of power factor. The whole is intimately associated with the question of the voltage of supply and has induced supply authorities to restrict the size of closed rotor motors in all but exceptional circumstances. 400 volts should be the minimum allowed by statute for all power supplies other than those deriving energy from public lighting a.c. street distributors. When its potentialities are fully appreciated there will be a big field for the single-phase commutator motor on all a.c. systems.

Walter E. Rogers, A.M.I.E.E.

London, *September 28th*, 1924.

Radio Transformer Characteristics.

The letter of Mr. H. E. Coleman in your issue of September 26th (page 487) *re* our intervalve transformer design will doubtless be of interest to transformer designers. The statements made, however, cannot be said to represent the whole truth, as several very important points are not mentioned.

The paragraph given as a guide in judging the intervalve transformer is surely unnecessary, as it must be fully anticipated by every beginner on the subject. Unfortunately, the author of this good advice does not state the conditions under which the straight-line curve is to be obtained.

What about the variation of amplification factor for different values of input energy when the frequency is maintained constant?

What about relative efficiency of the whole circuit when

the simple or basic notes have superimposed upon them several very much higher frequencies, but of infinitely smaller volume?

These are some of the points not raised in your correspondent's letter, or taken into account in the N.P.L. Certificate.

No credit is given to the designers for any knowledge of the real problems at issue, although it must be realised that efforts are being made daily to produce transformers which give the minimum of distortion under actual conditions, and not merely in such a form, on paper, as would satisfy your correspondent.

As regards the N.P.L. Certificate, it is not given as a certificate of efficiency, but as proof of the manufacturer's faith in his own product. Also, it is only a short period since editors of the technical Press asked for the publication of official certificates in connection with radio apparatus, and if the N.P.L. is not qualified to give them, one naturally begins to wonder who is qualified.

Criticism, to be of value, must take into account all the factors of the problems at issue, and not merely one or two of the most obvious.

Wm. A. Appleton, M.B.E., M.I.R.E.
Director of Research, R.I., Ltd.

London, *September 25th*, 1924.

With reference to Messrs. Radio Instruments, Ltd.'s, reply to my letter on the above subject, it is interesting to note that their propensity for distortion does not end with radio transformers, but extends to the English language. In view of Mr. Coleman's letter in your current issue, which corroborates and amplifies mine (distortionlessly), there is no need to dwell upon the question of good taste with regard to my reference to the N.P.L. But it was because of "the valuable work of this national institution" that I took exception to its name and crest being dragged in the mud to further the interests of a private company.

Practically distortionless transformers are obtainable, as, for example, the Marconi "Ideal" transformer. The frequency-amplification valves of this transformer, which was dealt with in your issue of August 1st, show that at a frequency of 300 the voltage amplification was 28.6, at a frequency of 1,000 it was 32.5, at a frequency of 2,000 it was 32.6, and at a frequency of 4,000 it was 32. I would also refer the technical staff of Messrs. Radio Instruments, Ltd., to the paper by Mr. L. C. Pocock on "Faithful Reproduction in Radio Telephony" in the September issue of the *Journal* of the I.E.E.

As to the technical staff of the Electrical Review being "radio experts," I did not know that they claimed this distinction (in view of the definition of an expert), but I am certain that they do not claim to be musical experts as well. Their appreciation of the distortionless qualities of the transformer in question may be likened to the slum child who, when taken into the country and given a new-laid egg, would not eat it, because, he said, it had no taste. In any case, they only found the transformer to be "an improvement on the original type," which, of course, might still, and does, denote a negative quantity $(-2+1=-1)$.

D. V. Onslow.

London, *September 26th*, 1924.

University Parliamentary Representation.

As most of our Universities now have faculties of engineering, engineers should be interested in the preservation of the Parliamentary representation of the Universities. There is danger of this being lost if the University elections are treated in a party manner, so as merely to add one more seat to some section. In that case probably all parties will combine to oppose the present privilege. The seats were given in order that the Universities as such, and education in general, might be represented. Consequently the member should be an independent one, especially as the graduates (12,000 in the case of the University of London) represent all shades of political opinion. The seats may also be lost if the graduates do not exercise their vote; but to do this they must be on the Parliamentary Register of their University. In assisting with the candidature of Dr. Graham Little, M.D., F.R.C.P., who is standing as the non-party candidate for the representation of the University of London, I have been surprised at the number of graduates in engineering who are *not* on the Parliamentary Register of the University of London. Hence this letter, which is to urge all my fellow graduates in all faculties to register.

Forms of claim and the conditions of registration may be obtained on application to the University. All correspondence should be marked "Parliamentary Register," and addressed to: The Vice-Chancellor, University of London, S. Kensington, S.W.7.

A. S. E. Ackermann,
Deputy Chairman of Convocation, 1921-3.

London, *September 22nd*, 1924.

Electric Cooking and Heating.

As you invite correspondence on this subject, I think one or two notes with regard to my own experience may be useful. For the last few years, I have run my house "all electric," although when I bought it, it was fitted with the usual fireplaces, but in three of the bedrooms and the drawing room, gas radiators had been fitted.

When I changed over to "all electric," I experienced a great amount of trouble due to moisture showing round the chimney breasts inside the bedrooms, although I was informed by the previous owner that all chimneys had recently been re-flashed. In an effort to get rid of this, I had each one of the chimneys pointed and reflashed with much more lead, but even this did not get rid of the trouble, which I eventually traced to the high winds (we are 850 ft. above sea level) blowing the rain up the tiles, so that it ran down the inside of the tiles on to the chimney breasts. As this trouble had not been experienced when coal fires were used, I came to the conclusion that any moisture which had got round the chimney stack was evaporated when fires or gas radiators were used.

The trouble was eventually overcome by cementing the tiles on the outside round about the chimneys, and removing entirely one chimney which was never likely to be used again.

Another difficulty arose, due to wastage of current. In this district many of the maids belong to mining families, and to use their own words: "It takes them all their time to burn the coal allowed them by the colliery company" (generally one ton per month). Consequently, they are accustomed to very big fires, and do not always take kindly to the electric home.

To stop this wastage in one particular case, I effected a cure by allowing coal fires in the house for about three weeks, and the extra attention required, due to lighting the fires, keeping them stoked, and clearing away the consequent ashes and dust settled the matter—the maid was very glad to go back to electricity.

I have had indicating lamps fitted on the immersion heater and on all big current-consuming apparatus, such as wash boiler, oven, &c. This generally prevents a considerable amount of waste.

If I have the opportunity of erecting a new house for myself I shall do away with all chimneys except one, which would be in the kitchen, but I should only do this because it would be easier to sell the house than if it were fitted without one chimney, as we appear to be still quite a long way from overcoming the prejudices of so many people against the use of electricity for all purposes in the home.

If ventilators are fitted in rooms, I believe they should not be very big, and great care should be taken in their fixing to prevent draughts from the door passing across the room. I have no extra ventilation in any of my rooms, and I find that the rooms do not get stuffy. There is generally quite sufficient clearance of the bad atmosphere due to the opening of the doors.

According to my experience, the principal function of ventilators seems to be not to introduce fresh air, but to carry away the moisture-laden atmosphere, instead of condensation taking place in the house, with consequent mouldiness.

The desire to sit round a fire is so bred in the British nation that fireplaces will have to be built, even in the "all-electric" home. By fireplaces, I mean chimney-less fireplaces, but these can be laid flat against the wall, without any chimney breast.

To suggest to Englishmen that they should do without a spot which they can gather round and look at the clock and ornaments on the mantel-piece is almost like sacrilege; in spite of the fact that it is much easier and cheaper to fit the furniture in a room without a fireplace.

I think the suggestion that a saving of £300-£400 can be made if fireplaces and chimneys are not built is rather too high. Many Corporation Housing Committees are only paying this figure for the houses themselves.

Unfortunately, the domestic tariff fixed on the rateable value is not particularly applicable to houses rated above £50 per annum, and it is only in this type of house that such a heavy saving can be made by not having fireplaces and chimneys. If there were a reduced rateable-value charge on the more highly rated houses, one could with more confidence recommend electricity for all purposes.

A. E. Jepson.

Sheffield, *September 23rd*, 1924.

Electricity Used Dangerously.

Referring to your remarks under my letter in the current issue, there is very little doubt about the earthing of water heaters, geysers, &c., if they are permanently connected to the cold water supply, whether direct from the water company's mains or through a ball-valve feed cistern, for the reason that all water piping and feed cisterns are of metal and metallically continuous. In very exceptional circumstances there may be a few slate cisterns left in the country, but where water heaters are connected to such supplies it is up to the contractor to see that the metal water pipe connections are electrically continuous. In like manner contractors would make certain of their earth connections for lighting conduits or other purposes.

One should always test earth connections made to water pipes, to see that the earth path is continuous.

In some old installations there may be found leather joints or washers that do not provide a metal path even through the bolts and unions.

George Nobbs, Ltd.
C. Geo. Nobbs,
Governing Director.

London, *September 26th*, 1924.

Business Notes.

Bankruptcy Proceedings.—H. E. Checkley, plumber and electrician, 20, Well Street, Morecambe.—Application for discharge to be heard on October 21st, at the Sessions Hall, Preston.

W. P. Young (W. P. Young & Co. and The Leicester Tanning Machinery Co.), mechanical and electrical engineer, 40 & 42, Sanvey Gate, Leicester.—Last day for proofs for dividend October 8th. Trustee, Mr. T. F. Birch, Court Chambers, Friars Lane, Leicester.

J. S. Turner (Stanley Motor Co.), electrical and motor engineer, 542, Stanley Road, Bootle.—Last day for proofs for dividend October 8th. Trustee, Mr. E. D. Symond, Official Receiver, 11, Dale Street, Liverpool.

A. Edelman & C. Edelman (A. & C. Edelman & Co.), electrical engineers and contractors, 139, Govan Street, Glasgow.—Public examination October 7th, at the Chambers of Mr. Sheriff Fyfe, County Buildings, 50, Wilson Street, Glasgow. Meeting of creditors at the offices of Messrs. T. Smith & Sons, 135, Buchanan Street, Glasgow, on November 12th.

T. R. W. Wyness (trading in co-partnership with G. W. Bale as Wyness & Bale), electrical engineer, 13, Commercial Street, Brighouse, York.—Application for discharge to be heard October 27th, at the County Court House, Halifax.

P. Boswell (Boswell & Co.), electrical engineer, 110, Ebury Street, Westminster, S.W.—Last day for proofs for dividend October 8th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

S. B. Weston (Westforrest Radio Co.), wireless apparatus manufacturer, Utworth Manor, Cranleigh, and Playhouse Arcade, High Street, Guildford.—Last day for proofs for dividend October 13th. Trustee, Mr. T. Gourlay, 29, Russell Square, W.C.1.

F. B. Thorpe, electrical engineer, 73, South End, Thorne, York, and 1a, West Laithe Gate, Doncaster.—Third dividend of 2s. 6d. in the £, payable October 11th, at 99, Albion Street, Leeds.

Company Liquidations.—Uni-Directional Apparatus Co., Ltd., 14-16, Cockspur Street, London, S.W.—Under a compulsory winding up order made against this company last April, on the petition of a creditor, accounts have been lodged showing liabilities of £455, against assets valued at £230, and a deficiency of £2,683 as regards contributories, the issued capital being 20,000 ordinary shares of 1s. each, and 1,458 preference shares of £1 each. Mr. J. W. Barwick Thompson, Official Receiver, reports that the company was registered as a private company on July 5th, 1923, with a nominal capital of £5,000, and was formed to carry on the business of electricians, and in particular to enter into an agreement with Mr. Aaron Barnett for the acquisition of patent No. 17,888 of 1922 for an electric lighting and dual ignition system for Ford cars. The price of the patent was agreed at £1,499, and was payable as to £500 cash on completion, £500 out of the first net profits, and 9,000 ordinary shares of 1s. each. The cash (£500) was duly paid and the shares allotted. The agreement contained a clause that in the event of the company's being wound up, the letters patent should re-vest and be re-assigned to the vendor. The company's business appears to have been confined to experiments with the patent. On July 16th, 1923, Barnett was appointed technical adviser to the company to March 25th, 1924, at a salary of £350 per annum, and on December 3rd, 1923, he assigned to the company all his interest in the above letters patent without any reservation. Shortly afterwards the company's working capital was exhausted and Barnett commenced the proceedings to recover arrears of salary, as a result of which the company was eventually ordered to be wound up. Barnett has claimed from the Official Receiver the return of the patent, his claim being based on the clause in the agreement of July 20th, 1923. In view of the fact that the letters patent were assigned to the company by an absolute assignment without any reservation, the Official Receiver has taken legal advice on the question and has been advised that Barnett is not entitled to have the patent re-assigned to him. It will be the duty of the Liquidator to take the necessary steps to dispose of the patent.

Electric Locomotion & Foundry Co., Ltd.—A meeting of creditors was called for September 30th. Particulars of claims to be forwarded by October 31st to the Liquidator, Mr. T. C. Martin, E. Milburn House, Newcastle-upon-Tyne.

Electrical Cabinet Works, Ltd.—A petition for the winding up of this company has been presented to the High Court by M. Lewis (Timber), Ltd., 78-82, Mansford Street, Bethnal Green, E., creditor, and will be heard in London on October 14th.

Morgan & Lister, Ltd.—A meeting of members is called for November 5th, at 116, Colmore Row, Birmingham, to hear an account of the winding up from the Liquidator, Mr. G. A. Lister.

Morgans (Birmingham) Electric Motors, Ltd.—Winding up voluntarily. Liquidator, Mr. H. J. Loveridge, Clarence Chambers, 39, Corporation Street, Birmingham. Meeting of creditors October 14th, at the offices of the Liquidator.

Electrical Contracts & Maintenance Co., Ltd.—A petition for the winding up of this company has been presented to the High Court by the General Electric Co., Ltd., Magnet House, Kingsway, W.C., and will be heard in London on October 14th.

Private Arrangements.—Astro Electric, Ltd., 45, Carlton House, Regent Street, London, S.W.1.—A meeting of the creditors of this company was held on September 22nd, at the above address. Mr. K. Rook Jones, the receiver for the debenture-holders, presented a statement of affairs as at July 21st, 1924, which showed liabilities of £1,886. The total assets were £1,632, leaving a deficiency of £254. With regard to debentures there were 20 of £50 each issued on November 5th, 1923. Mr. Jones was appointed receiver on July 7th last, and before that he was the sales manager of the company. It appeared that the company had made rather a considerable loss last year, and it was also handicapped by the want of liquid capital, and it had consequently not been able to advertise its goods as it would have liked. Providing the business was not sold, the company wished to carry on until December 31st, and it hoped by that time there would be sufficient to pay the creditors in full. After some discussion it was decided that the business should be continued until the end of December, providing it was not disposed of meanwhile, and that a further meeting of creditors should be convened early in 1925, when the facts would be placed before them.

E. J. Guy Thomas, trading as the South Wales Engineering Supply Co., Llanfair Buildings, St. Mary Street, Swansea.—The creditors interested herein were called together recently, when a statement of affairs was submitted by Messrs. Clarke, Dovey & Co., accountants, which disclosed liabilities of £3,871 and net assets of £1,779, or a deficiency of £2,092. It was pointed out that a private conference of the creditors had previously been held, when it was stated that the liabilities were about £950, and it was then thought that the assets were sufficient to pay 20s. in the £ if the debtor was given time. The creditors decided to wait for three months for a first payment of 10s. in the £, and a further three months for payment of the balance. It was also decided that a statement of affairs should be prepared by Messrs. Clarke, Dovey & Co., and that had been done. The accountants now pointed out that the bank only held collateral security with the result that it had to rank against the estate. The bank was not prepared to stand aside. In addition to the liabilities previously disclosed there were cash creditors, two moneylenders, to whom £475 was due. After discussing the position a resolution was passed to the effect that provided the securities held by the bank were allowed to be realised in settlement of its claim, the estate should be dealt with under a deed of assignment with Mr. S. E. Clutterbuck as trustee, with a committee consisting of the representatives of Messrs. Siemens and English Electric Lamp Co., Ltd., the General Electric Co., Ltd., and the Edison Swan Electric Co., Ltd. The following are the principal creditors:—

	£		£
New Liverpool Rubber Co., Ltd.	26	Cole, Henry A., Ltd.	124
Ferguson & Timpson, Ltd.	72	Edison Swan Electric Co., Ltd.	32
L.E.W. Co., Ltd.	18	Siemens & English Electric Lamp Co., Ltd.	201
General Electric Co., Ltd. ...	98	Home Rubber Co.	82
British Thomson-Houston Co., Ltd.	40	Crofts, Ltd	123

Deed of Assignment.—R. W. Aerstall and F. Tuck (R. W. Aerstall & Co.), electrical engineers, Cheetham Street and Drake Street, Rochdale.—Particulars of claims to be sent to the Trustee, Mr. C. E. Lewis, 3, King Street, Rochdale, by October 30th.

Receivers Appointed.—Boving Engineering Works, Ltd., 4, Broad Street Place, London, E.C.2.—Mr. D. M. Touche has been appointed receiver under Deed dated September 25th, 1924.

Coates & Co. (Sheffield), Ltd.—Mr. W. B. Gowers, 17, Bank Street, Sheffield, was appointed receiver on September 15th, 1924 (under powers contained in second debenture dated June 29th, 1923).

Trade Announcements.—Mr. W. Archer, who has retired from the firm of W. A. James & Archer, has commenced business on his own account as an electrical engineer at Maidenhead, under the style of W. Archer & Co. His temporary address is Marlow Road, and offices and works are to be opened at 16, Cookham Road.

Mr. G. R. Lance has commenced business as an electrical engineer at Mar Place, Alloa.

The Electrical Repairs Co. has taken larger premises at Tangier, Taunton.

Messrs. James Gordon & Co., of London, advise us that they have recently opened a branch office at 110, Waterloo Street, Glasgow, under the management of Mr. A. D. Burgess.

The telephone number of Messrs. Nalder Bros. & Thompson, Ltd., has been altered to 'Clissold 2365" (three lines).

The Weston Electrical Instrument Co., Ltd., has changed its address to 15, Great Saffron Hill, London, E.C.1.

Mr. J. H. Borrowdale is carrying on business as an electrical engineer at 13, Earls Road, Whitehaven.

Catalogues and Lists.—The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—The "Osram Bulletin" for August and three illustrated pamphlets dealing with the company's winter lighting "campaign" and "Osram" lamps.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—An illustrated and priced catalogue of "Cosmos" electric fires.

MESSRS. VERITYS, LTD., Aston, Birmingham.—Publication No. 955, giving full details of switch- and fuse-gear, motor starters, starting panels, and regulators for d.c. and a.c. Illustrated and priced.

SUPER-CENTRIFUGAL ENGINEERS, LTD., Imperial House, Kingsway, W.C.2.—An illustrated brochure dealing with the Sharples "Super-Centrifuge" for the dehydration of oils, &c., and its applications.

ASTRO ELECTRIC, LTD., 45-48, Carlton House, Lower Regent Street, S.W.1.—Form No. 3, containing prices and illustrations of several forms of "Astro" reflectors or intensifiers.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Descriptive Leaflet No. 591/1-1, illustrating magnetic brake equipment for tramcars. Several cars on which the system is used are depicted.

THE SIMPLEX ELECTRIC CO., 45, Harrow Road, Brislington, Bristol.—Two pamphlets, advertising the "Andy" fuse-wire wallet.

THE MIDLAND ELECTRIC MANUFACTURING CO., LTD., Barford Street, Birmingham.—An illustrated and priced pamphlet describing the new "Memette" combined switch and fuses.

MESSRS. EVERSHED & VIGNOLES, LTD., Acton Lane Works, Chiswick, W.4.—An illustrated brochure describing "Ducter" low-resistance testing sets.

MESSRS. DONOVAN & CO., 47, Cornwall Street, Birmingham.—An illustrated price list of electrical materials and appliances.

THE LELIOS LAMP CO., LTD., 58, Southwark Street, S.E.1.—A pamphlet describing the "Lelios Duolite," which gives two degrees of illumination.

THE MIRRLEES-WATSON CO., LTD., Scotland Street, Glasgow.—Pamphlet No. Pu. 900, containing a list of undertakings at which "Mirrlees" condensing plant has been installed.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—Catalogue No. 700, containing, in addition to illustrations and details of the firm's industrial and general lighting apparatus, a great deal of useful technical illumination data.

THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, W.C.2.—List S.121, describing the "Sanco" joint box for small flat cables.

For Sale.—Messrs. H. W. Figg & Son will offer by auction on October 6th and following day, at the Auction Rooms, 13, High Holborn, W.C., a stock of new electrical and wireless goods, &c.

Doncaster Corporation Electricity Department invites offers for one Belliss & Morcom triple-expansion engine, direct-coupled to a 300-kW d.c. dynamo.

By direction of the Air Ministry, Messrs. Horne & Co. will offer by auction on October 14th and following day, at the Air Ministry Depôt, Balmoral Road, Watford, electrical plant, machine tools and stores. For further particulars, see our advertisement pages to-day.

Book Notices.—"Facts Concerning London's Underground." (60 pp., illustrated.) London: "Underground" Publicity Department.—This is a series of five pamphlets in book form treating of various aspects of the extensive system operated by the "Underground" group. Each pamphlet is well-illustrated, written in a simple non-technical fashion, and entirely free from "gush." The first describes the Lots Road generating station; the second deals with the motor 'bus overhaul works at Chiswick; No. 3 is a description of the Acton railway overhaul works; No. 4 contains facts relating to the new works in hand; and the last shows how the undertaking is controlled by a complicated signal system. Such pamphlets as these are of great interest and educative value to the "Underground's" large public.

"*Quarterly Bulletin* of the Institution of Engineers, Australia" Vol. I, No. 3, July, 1924. Sydney: The Institution.—This issue contains a record of proceedings and a number of interesting notes. An obituary notice of the late Mr. J. R. Barnton, M.I.E.E., appears, details of standardisation committees are given, and an address on "The Registration of the Professional Engineer" is abstracted.

"Uncle Jack Frost's Wireless Yarns on Good Reception and how to get it," by Capt. C. C. J. Frost. Pp. ix+106; figs. 23. London: The Wireless Press, Ltd. Price 2s. net.

"Science Abstracts." (A and B.) Vol. XXVII. Part 9. No. 321. September 25th, 1924. London: E. & F. N. Spon, Ltd. Price 3s. each.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIII. No. 9. September, 1924. New York: The Institute. Price $1.

"Year Book of the Michigan College of Mines, 1923-24." Houghton, Michigan: The College.

"Publications of the United States Bureau of Standards. Scientific Papers No. 488 "Thermal Expansion of Molybdenum" (10 cents); No. 489, "Primary Radio-Frequency Standardisation by use of the Cathode-Ray Oscillograph"; and No. 491, "Theory of Determination of Ultra-Radio Frequencies by Standing Waves on Wires." Also a pamphlet on "Simplified Practice in the Marine Field" (5 cents). Washington: Government Printing Office.

"Marketing the Technical Product," by E. N. Simons. Pp. xi+200; illustrated. Manchester: Emmott & Co., Ltd. Price 7s. 6d. net.

"Industrial Conflict: The Way Out." by the Rt. Hon. G. N. Barnes. Pp. xi+100. London: Sir Isaac Pitman and Sons, Ltd. Price 3s. 6d. net.

The Metropolitan-Vickers Electrical Co., Ltd., has published an interesting brochure upon the electrification of the Metropolitan Railway. Very full technical details are included, and the publication is well illustrated.

Water Resources Paper No. 40, "Surface Water Supply of Canada. Arctic and Western Hudson Bay Drainage (and Mississippi drainage in Canada) in Alberta, Saskatchewan, Manitoba, and Western Ontario. Climatic Year 1921-22." (Pp. 278 and key map.) Ottawa: F. A. Acland (for the Dominion Water Power Branch).—This contains tabulated statistics compiled as a result of detailed hydrometric surveys in the areas mentioned.

The York Contract.—Mr. D. N. Dunlop, director of the B.E.A.M.A., has written a letter to the *Yorkshire Herald* (September 24th), emphatically repudiating certain unwarranted allegations made in a speech by Alderman Shipley, at a recent meeting of the York City Council. The speech was delivered in respect of the purchase of a turbo-alternator abroad and Alderman Shipley was reported as stating, in defence of the Council's action, that "we are being plundered by the electricity people of this country." Mr. Dunlop says that buyers who accept tenders for electrical machinery at "dumping" prices are encouraging unfair assaults on British trade. "Prejudice of this sort is the foe of a fair standard of wages for our employés and a higher standard of living generally, combined with shorter hours of labour."

The London Pact and British Industry.—Two leading industrialists and two heads of large export firms expressed their views in the September issue of *System* as to the effects of the London Agreement, involving a loan to Germany, upon British industry.

Mr. M. J. Railing, director and general manager of the General Electric Co., Ltd., gave it as his opinion that the loan would be followed by other direct loans of large amounts. He anticipated that this would have two major effects, *viz.*, first, the purchasing powers of our former enemies would be increased, enabling them to resume their position as Britain's customers, and the interchange of trade would become more normal; and, secondly, it would encourage German industry, and this, in view of the low rates of wages paid, might result in a flood of cheap goods with which the British manufacturer would have to compete, both at home and abroad. By virtue of tariffs, the manufacturer in America and most European countries could count on his home market to assist in getting the output which would give him the low cost prices which he required to enable him to compete abroad; the British manufacturer had no such assistance. The higher standard of living in Great Britain inevitably meant a somewhat higher cost of production. Apparently it was not realised by a number of public bodies that money spent on work in this country meant public money saved on unemployment pay.

The altered situation, in Mr. Railing's view, might develop along one or other of three main lines. It might result in a tremendous effort on our part to meet all competitors in cheap goods in all markets. This could only be done by a drastic reduction of the standard of living which was not considered possible or desirable. It might result in our having to drop right out of the market for cheap goods and concentrate on the production of high-grade specialised products. This would mean increased unemployment and emigration. There was a third possibility. In all probability nothing could prevent intense competition from the Continent for some years to come. There would be a reaction, however, and the workers in Continental countries would demand higher wages, shorter hours, and better conditions. Thus in the end the state of equilibrium would be reached. With regard to the electrical industry, Mr. Railing concluded by saying that there were good reasons for feeling optimistic.

New Radio Apparatus Trade Associations.—Der Verband Deutscher Radio Handler is the name of an association of German wireless traders which has recently been formed in Berlin. The objects of the association are to place business on a solid foundation and to prevent price-cutting. It is proposed to form branches in all the principal German towns.

As recently stated by us, a Wireless Traders' Association has been formed in Johannesburg. Col. H. B. T. Childs, representative of the Marconi companies in South Africa, is the first president. The principle object of the new Association is "to protect and promote the interests of all dealers in wireless apparatus."

Russia's Foreign Trade.—An official Russian review of foreign trade during the first quarter of the current year shows that Germany supplied the bulk of the electrical material which was imported. The value of electrical supplies and lamps supplied is given as 1,191,000 gold roubles, and that of electrical machinery 140,000 roubles. Great Britain supplied electrical machinery to the value of 102,000 roubles.

Annual Dinner.—The London office staff of Vickers and International Combustion Engineering, Ltd., held its first annual dinner at the Connaught Rooms on September 23rd. Mr. G. C. Usher, the general manager, occupied the chair, and he was supported by the managing director, Mr. G. R. T. Taylor.

British Empire Exhibition Note.—On September 21st a party numbering about 1,300 of the employés of Messrs. J. Hopkinson & Co., Ltd., Huddersfield, visited the Exhibition.

New Zealand Contract for Bruce Peebles.—In connection with the extensions which are now taking place at the Lake Coleridge hydro-electric power station of the New Zealand Government, Messrs. Bruce Peebles and Co., Ltd., Edinburgh, have been successful in securing the contract for the supply of the two 7,500-kW alternators, each complete with direct coupled exciter. The alternators will be designed to operate at .85 power factor, and to generate three-phase, 50-cycle current at a pressure of 6,600/7,000 V when driven at a normal speed of 500 r.p.m. They will be of the totally enclosed forced ventilated type, the cooling air being provided by an induction motor-driven fan which is also to be supplied by the firm. There will be two main bearings of the forced lubricated type, the oil pump being driven by belt from the main shaft. The alternators will be designed to withstand a runaway speed of 90 per cent. above normal. The contract includes the supply of oil tanks and strainers, oil coolers with water tanks, and all apparatus necessary for the successful operation of the plant. Messrs. Bruce Peebles supplied the original generating plant which has been in successful operation for many years.

Lead.—In their report dated September 27th, Messrs. James Forster & Co. stated that there was little change to report in the general position. The weakness of September lead was due to further substantial arrivals coming upon a market which was already satiated with the metal. Forward lead, however, was well held, but (which was a source of weakness) chiefly by speculators for a rise. Messrs. Forster say that in the report appearing in this column last week they inadvertently stated that 8,000 tons was the August output of sheet and pipe lead, whereas that was the July figure. The August output was a little more than 6,000 tons.

The Trade Situation in Sweden.—Reports from Sweden credit Mr. Hemming Johansson, director of the L. M. Ericsson Co., with the statement that the orders received so far in the present year have been fairly constant both for the telephone workshops and for the cable works, representing a total value of about 8,000,000 kr. The manufactures delivered in the first half of the current year amounted to 7,600,000 kr., as compared with 7,100,000 kr. in the corresponding period of last year, there having been practically no change in prices. Concerning the subsidiary companies, the development of the British company is stated to have been such that a record year is expected, while the French company has trebled its orders during the present year.

Supply Company's Propaganda.—The Boston and District Electric Supply Co., Ltd., has sent us a copy of a booklet which it is circulating in its area. In this the advantages of electrical methods are set forth, and examples of appliances, &c., are illustrated. Lamps, cookers, irons, fires, motors, &c., are dealt with. In addition to this information, the booklet contains a list showing the motor power required for various classes of machinery and trades. Seed mills, printing works, dairies, hotels, breweries, bootmaking and other branches of industry are mentioned.

Norwegian State Aid for Hydro-Electric Works.—The Norwegian State Government has provided approximately 4,000,000 crowns for the support of 19 electric power plants that are in financial difficulty. This amount is equally divided into two sums, one to be used for direct contributions and the other for loan guarantees. In order to obtain a contribution from the State, the municipality in which the plant is located must consent to take into its budget the greater part of the loss incurred through operation. In addition to this, the creditors must, among other concessions, not charge more than 6 per cent. interest on their respective claims.—*Commerce Reports.*

The Morecambe Carnival.—Streets and buildings were illuminated by the Corporation in co-operation with local electrical contractors in connection with the recent Morecambe Autumn Carnival. Amongst the private trade exhibits in the two-mile long procession which opened the carnival Messrs. Hearnshaws had a lorry bearing a display of domestic electrical appliances and radio equipment. The Lancaster Electrical Fittings Company had a motor-cycle and side-car fitted as a model house and garden. Over the house was a miniature radio aerial, and in addition to neatly painted signs in the garden the house was equipped with electrical appliances.

American Participation in British Engineering Exhibition.—The *Electrical World* states that Mr. F. W. Bridges, manager of the Shipping, Engineering, and Machinery Exhibition, which is to be held at Olympia in November and December next year, is visiting the United States with a view to securing the participation of American manufacturers. It is said that the new annexe to Olympia will permit of the exhibition of the products of a number of foreign firms.

Chinese Foreign Trade.—In a review of an official Chinese trade report for 1923, the *Chamber of Commerce Journal* states that the value of electrical materials and fittings imported declined from 9.4 million taels in 1922 to 8.1 million taels. The principal countries of origin were Japan (2,495,131 taels), Germany (2,064,119 taels), the United States (1,322,092 taels), Great Britain (1,244,519 taels), Belgium (232,707 taels), and the Netherlands (219,062 taels).

The Government Trade Inquiry.—At the invitation of the Trade Inquiry Committee (of which Sir Arthur Balfour is chairman) the Federation of British Industries is to give evidence before it. The ground to be covered first is evidence from the national organisations on the general terms of reference; later the individual trades will be heard. The Federation has resolved to set up a committee representative of the individual trades, especially of the Trade Associations, to draw up such evidence. Points of detail which it will be better to leave to individual trades will be avoided.

Australian Dumping Duties.—Section 4 of the Customs Tariff (Industries' Preservation Act) has been extended to oil circuit-breakers, originating in or exported from the United States, the landed duty-paid cost of which is less than the manufacturers' selling price of a comparable Australian-made article. Section 8 of the Act is extended to apply to bogie trucks originating in or exported from Germany, on the ground that the German currency had depreciated to such an extent that the goods are being sold in Australia at prices detrimental to an Australian industry.—*Reuter's Trade Service* (Melbourne).

Mexican Machinery Imports.—A review of the imports of machinery into Mexico recently appeared in *Commerce Reports.* It is stated that as in the official statistics, industrial machinery, agricultural machinery, and electrical equipment are set down together, it is not possible to make a detailed survey. In 1923 the value of imported machinery and parts was 34,938,560 pesos, as compared with 28,904,568 pesos in 1922. Of these totals, the United States supplied 29,632,782 pesos and 20,308,040 pesos respectively. In both years Great Britain was third (Germany being second) with 1,945,849 pesos and 2,630,770 pesos respectively.

Unemployment.—Although the rate of increase in the number of unemployed has fallen, the total at September 15th (1,164,000) was 352 higher than in the previous week.

American Aid for French Railway Electrification.—The New York correspondent of *The Times* reports that a New York banking group has taken up Paris, Lyons, and Mediterranean Railway bonds, bearing interest at 7 per cent., to the value of $20,000,000. The proceeds are to be used for the further electrification of the system.

New Belgian Companies.—La Lampe Electrique Belge is the style of a company formed at Brussels (13, Rue Bréderode), for the manufacture of electrical apparatus—especially glow lamps. Its capital is 5,000,000 fr.

The Société Belge pour la Fabrication des Cables et Fils Electriques is a company constituted for the manufacture of electric wires and cables. Its capital is 4,250,000 fr. and its headquarters are at 79, Rue du Marché, Brussels.

New Australian Company.—The *Sydney Daily Telegraph* reports the formation of Electric Motors, Ltd., with a capital of £10,000, to trade as electrical and mechanical engineers, suppliers of electricity, and manufacturers of and dealers in electric motors and other apparatus, &c.

British Electrical Exports to Malaya.—The *Board of Trade Journal*, in a review of the imports into British Malaya from the United Kingdom during the first half of the current year, states that the total value was £4,978,725, of which electrical goods and apparatus accounted for £107,312.

A "Lopulco" Installation at a Flax Mill.—Vickers and International Combustion Engineering, Ltd., has secured a contract for the installation of a steam-raising plant on the "Lopulco" system at a large flax mill in Belfast. The plant is an entirely new one, and consists of buildings, coal-handling plant, boilers, burners, pulverisers, &c. It is to be used in the generation of electricity for the mill.

Electrical Business in Chile.—*Commerce Reports* states that although Chilean business activity, generally, slackened during August, the market for electrical supplies continued good. The demand for radio equipment was specially pronounced.

Lighting and Power Notes.

Australia.—Cockle Creek (N.S.W.).—According to *Tenders*, Caledonian Collieries, Ltd., has a scheme in hand for the erection of a power station at Cockle Creek for the supply of electrical energy to its collieries in the Newcastle and Maitland coalfields. It is proposed to install either two 3,000-kW generators, or one of 3,000 kW and one of 5,000 kW.

Belgian Congo.—La Société Coloniale de Construction, of Brussels, has secured the contract for the establishment of electricity distribution systems at Elisabethville and Leopoldville-Kinshasa, in the Belgian Congo, in connection with the central stations which are being established by the Société Coloniale d'Electricité under 30-year concessions.

Bury St. Edmunds.—Loan Sanctioned.—The Town Council has received the sanction of the Electricity Commissioners to a loan of £4,304 for new mains.

Chester.—Electricity Extensions.—The Electricity Committee is making application to the Electricity Commissioners for sanction to borrow £4,000 for distributing mains on the Curzon Park Estate. At a recent meeting of the Council, extensions of the supply to Aldford, Tarom, and Barrow at a cost of £5,000 were authorised.

Continental.—Latvia.—According to *Commerce Reports*, the Government has for some time been studying the possibilities of developing hydro-electric power on the Dwina River. The project is being studied at present by German and Swiss interests which would probably combine with the local Government and the city of Riga to form a company. Estimates of the cost of the scheme vary from $2,500,000 to $7,500,000, depending upon the extent of the development.

France.—The Syndicat d'Electrification de l'Arrondissement de Vouziers, in the Ardennes, has drafted an extensive programme, which is to be taken in hand forthwith. Its main features are:—Erection of seven h.p. distribution lines and construction of l.p. networks in ten communes. The cost is estimated at 2,716,786 fr. for the former, and 2,055,000 fr. for the latter. Tenders are now being invited for these works by M. Lionel Huete, the president of the syndicate.

The Société des Mines de Lens, one of the principal coal mining concerns in Northern France, has applied for powers to install a 15,000-V underground main to connect its electricity system with that of the Société Houillère de Lievin. The object is to enable one system to assist the other in the event of breakdown of, or excess demand on either.

According to the recently issued report of the chief engineer of the Paris lighting service the total capacity of the generating stations in the Paris district increased from 95,000 kW in 1919, to 200,000 kW in 1923. This was necessitated by the addition of 175,000 consumers to the 200,000 total in December, 1919, the replacement of numerous internal combustion engines by electric motors and immense strides in shop window and street lighting. The two principal generating stations are being enlarged; the St. Ouen plant will have a capacity of 340,000 kW by 1926, while the Issy-les-Moulineaux station will be increased from 30,000 kW to 110,000 kW during the same period. It is anticipated that even this supply will be insufficient to meet future demands, and as land in the neighbourhood of Paris is expensive and difficult to secure, the transmission of electricity from hydro-electric stations in the mountainous regions of France will be attempted.

Switzerland.—The Swiss Government has recently granted a concession for the establishment of a hydro-electric plant to utilise the power of the River Albigna near Vicosoprano, Canton of Graub. The project, which will take from three to four years to complete, involves the construction of a dam to form a reservoir. It is estimated that 30,000 h.p. will be available.

Dundee.—Electricity Extensions.—Tenders for the extension of Carolina Port generating station amounting to £100,000 have been accepted by the Corporation Electricity Committee. The Electricity Commissioners have granted further borrowing powers to the extent of £78,800.

Earlestown.—New Sub-Stations.—Tenders have been accepted by the Newton-in-Makerfield Urban District Council for the erection and equipment of two sub-stations in the district involving an expenditure of £23,355.

Exeter.—Proposed Purchasing of Undertaking.—The Electricity Commissioners have informed the City Council that they are prepared to grant the Order applied for by the Council to extend its area of electricity supply, providing it enters into negotiation with the Topsham Electricity Supply Co., Ltd., with a view to purchasing the company's undertaking. The Electricity Committee has recommended that a sub-committee be appointed for this purpose.

Faversham.—Loans.—The Town Council has received the sanction of the Electricity Commissioners to loans of £7,000 for additional plant at the electricity works, and £3,300 for a battery.

Garnant (Carmarthen).—Supply for Colliery.—The North Amman Collieries, Ltd., has applied to the Swansea Corporation for a supply of electricity to the Camb Colliery. The cost of the scheme is estimated at £1,000, and the Corporation has agreed to give a supply, subject to the sanction of the Electricity Commissioners being obtained.

Glasgow.—Loan Sanctioned.—The Corporation has received the sanction of the Electricity Commissioners to the borrowing of £1,850,000 for electricity purposes.

Hawarden.—Electricity Supply.—Cables are now being laid in the district in connection with the provision of an electricity supply, and the Councils of Connah's Quay and Hawarden are canvassing the ratepayers to ascertain the probable consumption.

Hornsey.—New Sub-Station.—On Saturday last a new sub-station was opened by the Mayor of Hornsey; Mr. Ald. Moritz, chairman of the Electricity Committee, presided at the opening ceremony, and the borough electrical engineer, Mr. N. Staniland, and his staff were congratulated on the completion of the work.

Ilford.—Year's Working.—The accounts of the Urban District Council's electricity undertaking (engineer: Mr. A. H. Shaw) for the year ended March 31st last record a total revenue of £96,890, as compared with £93,634 in the preceding year. Working expenses totalled £59,489, as against £54,786, leaving a gross profit of £37,401 (£38,848), to which was added bank interest of £125, making a total of £37,526. Capital charges absorbed £20,467, and there was a net surplus of £17,059, of which £6,000 was transferred to depreciation and renewals account, and the remainder to reserve. In the previous year there was a surplus of £17,194. The capital expenditure during the year amounted to £33,843, the chief item being £23,094 for mains and services. The sales of electrical energy amounted to 7,869,631 kWh, an increase of 28.4 per cent., and the maximum supply demanded rose from 3,388 to 4,120 kW.

Irish Free State.—Kingstown (Co. Dublin).—It was stated at a recent meeting of the Urban District Council that the electricity scheme was nearing completion and would be in operation in October.

Keynsham.—Street Lighting.—The local Council has entered into a contract with the Bristol Corporation for lighting 146 lamps until May 31st at £337 10s.

Lancaster.—New Plant.—The Town Council has decided to purchase a 2,000-kW turbo-generator from the Disposal and Liquidation Commission for £3,100. It will cost £1,900 to dismantle the machine and re-erect it at Caton Road works to suit the present supply, together with the necessary switchgear and auxiliary plant. An application is to be made to the Electricity Commissioners for sanction to borrow £5,000.

London.—Poplar.—The Borough Council has received the sanction of the Electricity Commissioners to the installation of one 10,000-kW turbo-generator and three 55,000-lb. boilers, with the necessary buildings. The cost of the scheme is estimated at £149,200.

Manchester.—Loans Sanctioned.—The Electricity Commissioners have sanctioned the borrowing of £100,000 for feeder mains and £40,000 for new stores at High Street.

Middleton.—Supply Agreement.—The agreement with the Manchester Corporation for the supply of electricity expired on March 31st last, but it was continued until September 30th. A new agreement for a period of five years has been prepared, only minor modifications having been made.

Morecambe.—Loan Sanctioned.—The Town Council has received the sanction of the Electricity Commissioners to a loan of £3,100 for public lighting by electricity at Heysham.

Northern Ireland.—Ballygawley (Co. Tyrone).—The electric lighting scheme for the town was recently formally inaugurated.

Preston.—Electricity Supply.—At a recent meeting of the Town Council, reference was made to recent interruptions in the electricity supply of the suburbs, due to the great increase in the number of consumers. It was stated that the new station had not been completed as early as was anticipated, but it was expected that water would be taken from the river for the condensers in about three weeks' time. It would take two or three weeks longer to get the turbo-generators to work. The cause of the interruptions was the overloading of the transformers. During the last two years there had been an increase of nearly one million kWh in the consumption of electricity, mostly in the suburbs. Additional transformers were on order, and the new station would be in good running order in about two months' time. The plant at the Ribble Station was practically complete, the h.p. switchgear at Crown Street was ready, the two 1,500 kW rotary converters were expected shortly, and one of the two 500-kW rotary converters for Messrs. Dick, Kerr's joint sub-station, was also ready for operation.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Halifax.—Lighting, flat rate: Over 1,200 kWh per quarter, from 3½d. to 2d. per kWh. Power: The kilowatt charge is reduced from £6 to £5 15s.

Leicester.—Lighting: First 1,200 kWh per quarter, from 6d. to 5d. per kWh; all energy in excess of this amount from 5½d. to 4½d. per kWh. Power: The percentage increase to be reduced from 50 to 33⅓, and for consumption of 60,000 kWh or over per quarter, from 0.75d. to 0.73d. per kWh, plus 33⅓ per cent. Domestic tariff: From 5s. 9d. to 4s. 8d. per point per annum, plus 1d. per kWh.

Rochdale.—Special Order.—The Corporation has applied to the Electricity Commissioners for a Special Order authorising it to extend its area of supply so as to include the urban districts of Norden and Wardle.

Walthamstow.—New Plant.—The Urban District Council has received sanction to install additional plant at the Electricity Works at a cost of £66,000.

Walsall.—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Corporation to extend its area of electricity supply so as to include the rural district of Walsall and certain parishes in the rural district of Cannock.

West Ham.—New Plant.—The Town Council has received the sanction of the Electricity Commissioners to install additional plant at the power station at an estimated cost of £158,500.

Tramway and Railway Notes.

Australia.—Western Australia.—*Year's Working.*—We have received from Mr. W. H. Taylor, general manager of the Government tramway undertaking, a copy of the report on the working of the system for the year ended June 30th last. The total income was £274,583, and working expenditure £231,895, as compared with £262,689 and £213,928, respectively, in the previous year. The gross profit was thus £42,688 (£48,761). After deducting capital charges there was a net deficit of £155. In the preceding year there was a surplus of £8,342. The number of passengers carried increased from 25,993,983 to 27,893,315, and the car-miles run from 2,770,518 to 2,989,089. The receipts per car-mile fell from 4.23d. to 3.43d.

Sydney.—The revised report of the conference of representative bodies which considered the city traffic problems recommends that no additional streets in the city be used for tramways, and that, as opportunity offers, the tramways be removed altogether from the centre of the city. According to the report, the conference is strongly in favour of the use of motor 'buses in the city. The Lord Mayor of Sydney is convening a special meeting of the City Council so that the aldermen may have an opportunity of expressing their opinion on the recommendations before they are sent on to the Government for remedial legislation.—*Sydney Morning Herald.*

Bolton.—Track Renewals.—The Tramways Committee has decided to reconstruct the tramway track in Halliwell Road.

Brighton.—Light Railway.—The Corporation is applying to the Minister of Transport for an Order reviving the powers granted by the Brighton Corporation Light Railways Order, 1920.

Continental.—Germany.—Nine hundred tramcars are to be built to replace the old rolling stock now in use in Berlin.

France.—Plans have been prepared for the electrification of the local railways between Champagne and Foncine le Bas, and between Sirod and Boujailles, in the Department of Jura.

China.—Electric Signalling.—Electric signalling is being adopted on the Pekin-Mukden railway between Tangshan and Shanhaitwan.

Ilford.—Year's Working.—The report of the manager of the Urban District Council's tramway undertaking (Mr. L. E. Harvey) for the year ended March 31st last shows a total income of £66,618, as compared with £75,100 in the preceding year. Working expenses amounted to £54,183, as against £57,199, leaving a gross profit of £12,434 (£17,901), to which was added bank interest of £59, making a total of £12,493. After deducting capital charges there was a net surplus of £2,480, as compared with a profit of £7,327 in 1922-23. The number of passengers carried increased from 11,374,820 to 11,953,336, and the number of car-miles run from 882,430 to 926,183. The revenue per car-mile fell from 20.43d. to 17.26d.

Japan.—Railway Electrification.—The scheme for electrifying the Numazu to Akashi railway, 500 km. in length, will be taken in hand at the beginning of next year, and is expected to be completed by the end of the following year. The continuous current, distributed at a pressure of 1,500 V by an overhead line, will be produced in 25 sub-stations of a total power of 6,500 kW.

Northern Ireland.—Belfast.—*Year's Working.*—The accounts of the Corporation tramway undertaking (general manager, Mr. S. Carlisle) for the year ended March 31st last record a total revenue of £594,855, as compared with £641,718 in the preceding year. Working expenses totalled £404,856, as against £410,372, leaving a gross profit of £189,999 (£231,156). After deducting capital charges there was a net surplus of £31,651, as compared with £107,215 in 1922-23. The number of passengers carried was 94,237,313, as against 84,070,600, an increase of 12.09 per cent., and the number of car-miles run increased from 6,507,350 to 6,887,046.

Telegraph and Telephone Notes.

Atlantic Cables.—High-speed Working.—Tests on the loaded cable recently laid for the Western Union Telegraph Co. between New York and the Azores resulted, says *The Times*, in a speed of 1,700 letters per minute, which exceeds the estimated speed by 200 letters. The *Colonia* shipped the cable at Greenwich and sailed for New York on August 15th; the Azores were reached on September 20th, and the task of laying the cable was completed at Horta, where a Western Union station has been established. The new cable is to be used in connection with one of the ordinary type that an Italian company is laying between Italy and the Azores, which will establish for the first time submarine cable communication between Southern Europe and North America. The new cable was manufactured and laid by the Telegraph Construction and Maintenance Co., of London, which built and equipped with special machinery a new factory wing for the purpose. Nickel-iron "Permalloy" tape introduced by the Western Electric Co., is wrapped round the conductor.

Canada.—Strike Ended.—Most of the Canadian Press telegraph operators, who struck against a reduction of pay, returned to work last week, and the news service is normal again.

France.—Reorganising Communication.—When the new underground cable, which is to link Paris and Strasbourg, is completed, 150 wires will ensure telegraphic and telephonic communication between the two cities. The initial cost of the construction of the cable is estimated at 150 million francs. The original route along which it was to be laid has been somewhat modified, presumably for reasons of national defence, and it will reach Strasburg *via* Luneville, Baccarat, Raom-L'Etape, Saint Dié, and Selestat. It will link Paris with Switzerland and Central Europe, and when the proposed Paris-Boulogne-London cable has been constructed, communication between England and Central Europe may be relayed *via* Paris and Strasburg. Additional cables to Switzerland are also being planned. In course of time it is hoped that all the principal telegraph and telephone lines in France, now at the mercy of every big storm, may be placed underground. Work has actually begun on the Paris-Le Havre and Paris-Lille systems, and underground cables from Paris to Marseilles and Bordeaux are under consideration.—*Reuter* (Paris).

Gibraltar.—New Telephone Project.—The privately-owned telephone system is unsatisfactory, and a long-projected improvement has been initiated. The City Council, according to *Commerce Reports*, has issued an ordinance which gives the necessary authority, and it has been forwarded to London for approval. After the necessary legislation has been enacted, the Crown Agents for the Colonies will send out a telephone engineer to investigate the situation and prepare specifications, the City Council at Gibraltar making the final decision. The system will eventually be connected with the Spanish telephone system by trunk lines at the Spanish frontier town of La Linea.

According to the *Daily Telegraph*, the time for closing the telephone service has been extended to December 31st by the proprietor.

Italy.—The Telephone Service.—The proposal to transfer the internal communications from the State to private ownership began with the wireless service, and on September 23rd another step forward was decided upon with regard to telephones. The Postmaster-General invited tenders from competing firms. The conditions are severe. Guarantees must be given that the plant will be developed, that the capital is Italian, that the national industries shall be protected, that the rates will be reduced, that the *personnel* shall have fair treatment and not suffer by the transfer, and that the usual facilities for the Press shall be granted. Italy is to be divided into five zones, which will be ceded separately to different concessionaires with the object of avoiding inconvenient monopolies.—*The Times.*

Madeira.—Funchal Station Reopened.—It is announced by the *Board of Trade Journal* that the Funchal wireless station, which ceased working at the end of July, owing to a motor being burnt out, resumed work on September 12th.

Radio at Sea.—Wave Length.—It is announced by the Canadian Marine Department that as a result of negotiations with the British Government, the latter has issued orders to all British ships that a wave length of 450 metres must no longer be used within 250 miles of the coasts of Canada and Newfoundland. Canadian ships must refrain from using the same wave length at the same distance from the coast of the British Isles. Great Britain undertakes to persuade Continental countries to take similar action.—*Reuter* (Ottawa).

New Direction-finding Station.—The construction of the direction-finding station at Niton, St. Catherine's Point, the southernmost point of the Isle of Wight, will be completed, it is hoped, by the middle of this month. Ships will use the station in conjunction with that at the Lizard. A scheme for providing other direction-finding stations around the coast is under consideration.

Direction Finding.—The United American liner, *Reliance*, which arrived at Southampton on September 24th, is to be equipped with a Marconi radio direction finder. The range of the instrument is 100 miles without correction, and it covers all wavelengths from 400 to 1,000 metres. Most of the signalling between ships and shore and ships is on 600-metres wavelength, and the transmission of special signals by beacon stations is usually on 1,000 metres. The *s.s. Cleveland*, of the same line, already carries such equipment.

South Africa.—Automatic Telephony.—It is reported that the Town Council has approved of the conversion to the automatic system of the whole of the Durban telephone system during a period of four years, in sections of 2,000 telephones per annum, at an estimated cost of £40,000 per year.

Syria.—Radio Communication.—Telegraphic communication by radio between Beirut (Syria) and Belgrade (Yugoslavia) has recently been made available for commercial uses through an ordinance issued by the French High Commissioner for Syria. Messages are sent by radio at the same rates as those charged for their transmission by cable and land lines.—*T. & T. Age.*

The Telephone Service.—New Exchange.—A new telephone exchange, superseding an old one, was opened at Grappenhall, near Warrington, on September 27th. The new telephone exchange for Birkenhead is expected to be completed to enable the transfer to take place in December.

Radio Notes.

Broadcasting to Schools.—DAILY PROGRAMME.—A series of daily transmissions to schools at 3.15 p.m. was commenced by the B.B.C. on September 29th. A daily concert will also be broadcast from the London station between 1 and 2 p.m. while the Radio Exhibition is open.

Broadcasting at Sea.—MID-ATLANTIC CONCERTS.—On September 25th, in the Mersey, it was proved practicable to receive broadcast concerts on board ship. A test was made on the s.s. *Oropesa*, of the Pacific Navigation Co., and specially made "Polar Blok" apparatus was employed, the Chelmsford high-power station being received perfectly, as was also the Liverpool relay station. This development makes it possible for ships at sea to receive broadcast concerts up to ranges of 1,500 miles.

China.—BROADCASTING IN SHANGHAI.—It is reported from China that four broadcasting stations are now working in Shanghai.

Irish Free State.—BROADCASTING.—While the Free State Post Office has issued 1,560 receiving licences, there seems to be no popular demand for the establishment of a broadcasting station in the Free State. Such a station would, it is reported, result in a deficit of £5,000 per annum, and listeners are content with the B.B.C. programmes.

Poland.—NEW REGULATIONS.—A law was to be made effective in August, governing the use of apparatus by the general public. It is believed that licences for the operation of transmitting and broadcasting stations will be granted to scientific, educational, and manufacturing institutions, while regulations governing the use of receiving sets will be similar to those existing in France. The Government will issue special measures for the promotion of home industry.—*Commerce Reports.*

United States.—RADIO CONFERENCE.—The first National Radio Conference was held in February, 1922, the second in March, 1923, and the result has been less friction and misunderstanding through the voluntary co-operation of the industry, the public and the Department of Commerce, especially in the reduction of interference and the improvement of service. Secretary Hoover called the third Conference for September 20th at Washington, D.C., and some of the matters which were to be considered are:—(*a*) Revision of the present frequency or wave-length allocations, to reduce interference; (*b*) use of high frequencies or short waves; (*c*) classification of broadcasting stations; possible discontinuance of Class C; (*d*) interconnection of broadcasting stations; (*e*) limitation of power; division of time; zoning of stations; (*f*) means of distinguishing the identity of amateur calls from foreign countries; (*g*) interference by electrical devices other than radio transmitting stations; (*h*) relations between government and commercial services; and (*i*) such other topics as may be proposed by the Conference. Various groups named representatives who constituted the formal advisory committee of the Conference. The groups represented are as follows:—Listeners, marine service, broadcasting (one from each inspection district); engineering, transoceanic communication, wire interconnections, manufacturers, amateurs, point-to-point communication, government departments. The committee held public hearings and all persons or organisations having views to express had full opportunity to be heard. Some of the matters suggested for consideration are not within the regulatory control of the Secretary. As to such matters, any conclusions reached by the Conference can become effective only by voluntary adoption by the interests affected. As to the features falling within the powers of the Secretary, the recommendations of the Conference will be advisory to the Department of Commerce.

Workhouse Installations. — OFFICIAL APPROVAL. — Many Boards of Guardians in the country have installed broadcast radio receivers in workhouses. This movement is regarded with approval by the Ministry of Health on the ground of its educational value, apart from the pleasure it may afford. The *Evening News* is informed that in some cases the installations have been made by voluntary contributions from workhouse staffs or as gifts, but Boards of Guardians are at liberty to spend public funds on installations, the cost of which is small, and have done so.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Australia.—MELBOURNE.—November 26th. Melbourne and Metropolitan Tramway Board. Automatic sub-station equipment.

COMMONWEALTH POSTMASTER-GENERAL'S DEPARTMENT. — October 14th. Bells and buzzers.

November 11th. Switchboards, cord types, and spare parts.

November 18th. Transmitters, receivers, &c.

SYDNEY.—January 29th, 1925. Postmaster-General's Department. Automatic c.b. telephone equipment for the offices of the Ministry of Public Works.

November 5th. New South Wales Government Railways and Tramways. Three 12.5-kW and one 20-kW motor-generator sets.

November 19th. Switch-operating and lighting batteries. Chief electrical engineer, 61, Hunter Street, Sydney.

Belgian Congo.—November 20th. Belgian Ministry of the Colonies, 10, Rue Brederode, Brussels. Three wireless telegraphy valve receiving and transmitting sets for the Belgian Congo.

Belgium.—October 20th. Municipal authorities of Saint Gilles-lez-Bruxelles. 3,000 metres of 10 sq. mm. section armoured cables and 2,000 metres of 16 sq. mm. section. Specification for 3 fr.

October 20th. Députation Permanente of the Province of Limburg at Hasselt. Equipment of 20 transformer cabins. Particulars for 10 fr. from the Bureaux du Service Provincial d'Electricité, 27, Avenue Bamps, Hasselt.

Bradford.—October 16th. Corporation. One 500-kW automatic converting plant and switchgear; and four traction feeder panels. (September 19th.)

Canterbury.—October 24th. Electricity Department. One 1,250-kW, 3-phase turbo-alternator and condensing plant. (September 26th.)

Dublin.—October 8th. Commissioners of Public Works. Electric lighting installation at Mountjoy Prison. Specifications, &c., from Mr. J. J. Healy, secretary, Office of Public Works.

Dundee.—October 20th. Electricity Department. One 12,500-kW turbo-alternator set and condensing plant. (September 19th.)

Four 200-kVA transformers, 2 sets of e.h.p. sub-station switchgear, and e.h.p. and l.p. cable. (See this issue.)

Edinburgh.—October 13th. Corporation Electricity Department. Two 65/80,000-lb. water-tube boilers, with economisers, pulverised fuel plant, &c., for the Portobello station. (September 19th.)

Great Yarmouth.—October 14th. Electricity Department. E.h.p. and l.p. switchgear, with transformers. (See this issue.)

Ilford.—October 7th. Electricity Department. 660-V paper-insulated cables and joint boxes. (September 26th.)

India.—BOMBAY, BARODA, AND CENTRAL INDIA RAILWAY CO.—October 13th. Track bonds. (September 19th.)

October 24th. India Store Department, Belvedere Road, S.W. Diesel electric generator set. (See this issue.)

Leeds.—October 7th. Electricity Department. Structural steelwork required in connection with extensions at the electricity works. Mr. G. W. Atkinson, architect, 1, Mark Lane, Leeds.

London.—H.M. OFFICE OF WORKS.—October 22nd. Building manholes and the supply and laying of cables at the National Physical Laboratory, Teddington. (See this issue.)

Manchester.—October 9th. Electricity Committee. One electrically-operated and one hand-operated overhead 10-ton travelling cranes (spec. No. 81). Mr. S. L. Pearce, manager, Electricity Department, Town Hall, Manchester.

Mold.—October 20th. Urban District Council. The Council invites offers for the taking over of its Special Order and the institution of a scheme for the distribution of electricity in the urban district. Power will be supplied by the North Wales Power Co., Ltd. (September 26th.)

Morley.—October 7th. Town Council. Electrician's work required in erection of 48 houses on Middleton Road site. Specifications (No. 4) from Borough Engineer, Town Hall.

New Zealand.—GREY ELECTRIC POWER BOARD.—November 14th. Steam-driven generating plant.*

WELLINGTON.—October 28th. Public Works Department. Lake Coleridge Scheme. Switchboard, 6,600-V oil switches, &c.

November 18th. Switchgear for the Ngongotata sub-station, Waikato power scheme.*

Plymouth.—October 21st. Electricity Department. Four water-tube boilers, with economisers, chimney, &c. (September 26th.)

South Africa.—BEAUFORT WEST.—October 31st. Town Council. Power station plant for electric lighting scheme.*

CAPE TOWN.—October 29th. City Council. 500 or 1,000 street lighting fittings, l.p. a.c. switchgear.*

JOHANNESBURG.—November 12th. Municipal Council. One 750-kW rotary converter.*

Torquay.—October 20th. Electricity Department. One 3,000-kW turbo-alternator and surface condensing plant. (See this issue.)

Uruguay.—MONTEVIDEO.—November 19th. State Electricity works. 30,500 kg. of lubricating oils.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—City Council. Accepted :—
Insulated copper cables.—Item A (£8,485, approx.).—Enfield Cable Works (Aust.), Ltd. Items B and G (£499, approx.).—British Insulated and Helsby Cables, Ltd. Items C, D, E, and F (£4,795, approx.).—W. T. Henley's Telegraph Works Co., Ltd.—*Tenders.*

Electricity Supply Committee. Recommended :—
Erection and completion of extension to electric sub-station, Anderson Street, South Yarra (£303).—E. Newman.
100 suspension contactors, complete with hoods, and suspension clamps (£222).—Precision Engineering Co.
Two pulverised fuel equipments, complete with accessories (£2,843).—A. Herbert (Australia), Ltd.—*Tenders.*

Commonwealth Postmaster-General.
Supplies of cable for Postmaster-General's Department in New South Wales, Victoria, Queensland, South Australia, and Tasmania.—Enfield Cable Works, Ltd.

BRISBANE.—Tramway Trust.
15 car bodies and underframes (£1,300 each).—Meadowbank Manufacturing Co., of Sydney.
15 car bodies (£998 each).—T. Gardner (Brisbane).
15 underframes (£232 each).—Evans, Deakin & Co. (Brisbane).
68 tramway bogies (£9,615).—New South Wales Government Dockyards.—*Tenders.*

SYDNEY.—Electricity Committee. Recommended :—
5,000-V automatic induction regulators (£26,853).—Australian General Electric Co.
D.c. consumers' meters and spare parts (£3,819).—Edison Swan Electric Co., Ltd.
That the rotor of the 11,500-kW A.E.G. alternator be sent to the Allgemeine Electricitats Gesellschaft, Berlin, for repairs, at an estimated cost of £4,000.

N.S.W. Railways and Tramways. Accepted :—
Lead-covered telephone cable (£7,986).—Enfield Cable Works, Ltd.

Belgium.—One French and Four Belgian concerns competed for the supply and laying of a quantity of electric cable required in connection with the electrification of the railway between Brussels and Humbeek of the Société Nationale des Chemins de Fer Vicinaux. The quotations ranged from 263,687 to 314,016 fr., the lowest being that of the Société de la Manufacture de Cables Electriques et Caoutchouc, of Eupen.

One Swiss and four Belgian concerns submitted tenders last week to the Belgian State Railway authorities in Brussels for the supply of 34 kilometres of specially-insulated bronze wire. The offers ranged from 27,160 to 55,680 fr., the lowest being that of the Société des Cableries et Trefileries, of Cossonay, Switzerland.

Birmingham.—Board of Guardians. Accepted:—
Installation of an electric lift at the Erdington House C. Pavilion (£805).—Marryat & Scott.

Education Committee. Accepted :—
Installation of electric lighting at the undermentioned schools :—
Stirchley Street (£930); Yardley Secondary (£950).—J. Collier & Co. (Electrical Engineers), Ltd.
Station Road, Aston (£625); Golden Hillock Road (£905).—H. Hope and Sons, Ltd.
Oakley Road (£725); Norton Street (£546).—Lea, Son & Co., Ltd.
Tilton Road (£652); Cherrywood Road (£788); Highfield Road (£659).—Ellis & Ward, Ltd.
Bordesley Green (£748).—R. H. Newton.
Leigh Road (£1,006); George Dixon Secondary and Elementary (£1,487); Montgomery Street (£655); Somerville Road (£582).—Etna Lighting and Heating Co., Ltd.

Bolton.—Board of Guardians. Accepted:—
Electrical installations at Fishpool Institution, Townley's Hospital, and Hollin's Cottage Homes (£3,280).—Bolton Corporation and Farnworth U.D.C. Twenty-five tenders were received.

Glasgow.—Electricity Committee. Recommended:—
Centrifugal pumps for oil-cooling services at the Dalmarnock power station (£1,132).—Drysdale & Co., Ltd.

Corporation. Recommended :—
Electric lighting installation at the Woodside Public Halls (£497).—David Henderson.

Tramway Committee. Recommended :—
Ball insulators.—British Insulated & Helsby Cables, Ltd.
Starters for motor for subway works.—British Thomson-Houston Co., Ltd., and Brookhirst Switchgear, Ltd.
25 B magnets for cars.—Metropolitan-Vickers Electrical Co., Ltd.
Controllers for cars.—English Electric Co., Ltd.
Carey rail anchors.—Bolckow, Vaughan & Co., Ltd.
Inner and outer steel wire haulage ropes for subway.—R. S. Newall & Son, Ltd.

Ilford.—Urban Council. Accepted:—
Extensions to the sub-station at Goodmayes (£3,350).—Hammond & Miles, Ltd.

London.—ADMIRALTY.—Accepted :—
Lampholders and insulators.—Edison Swan Electric Co., Ltd.
SOUTHERN RAILWAY.—Accepted :—
Six months' supplies of Osram metal-filament, vacuum, and gasfilled lamps, also Robertson carbon-filament lamps.—General Electric Co., Ltd.

POPLAR.—Electricity Committee. The Committee recommends that Messrs. Vickers and International Combustion Engineering, Ltd., be accepted as prime contractors for the extensions to the electricity station, and that a contract be concluded with that company for the supply and erection of three Vickers-Spearing boilers at £34,216. The cost of the extensions is estimated at £149,200, and include a 10,000-kW turbo-generator, three 5,000-lb. boilers, with the necessary buildings.

ST. MARYLEBONE.—Electricity Committee recommended :—
Foundation work in connection with the supply of a water-softening and filtration plant (£3,605).—J. Garrett & Sons.
House service meters for the year ending September, 1925.—Chamberlain and Hookham, Ltd., and Ferranti, Ltd.
Steam separator and fittings for the new 12,500-kW turbo-alternator (£210).—Worthington-Simpson, Ltd. (Accepted.)

Maidstone.—Town Council. Accepted:—
Extensions to the electricity works (£7,190).—Messrs. Corben.

Manchester.—Electricity Committee. Accepted:—
Cable.—Callender's Cable and Construction Co., Ltd., and British Insulated & Helsby Cables, Ltd.
Coal.—100 tons per week for six months of Bolsover dry slack, at 19s. 4d. per ton.—Thrutchley & Co., Ltd.

Annual store contracts.
Adhesive tape.—L. Andrew & Co.; Connolly's (Blackley), Ltd.
Bittite tape.—Callender's Cable & Construction Co., Ltd.
Box compound.—British Insulated & Helsby Cables, Ltd.; Dussek Bitumen Co., Ltd.
Cable cover tiles.—Doulton & Co., Ltd. ; Gibbs Bros.
Carbon brushes.—Le Carbone; Morgan Crucible Co., Ltd.

Pickering.—Urban Council. Accepted:—
Installing electric light in the Memorial Hall.—Gibson & Cousins.

Salford.—Health Committee. Accepted:—
Electric supply cables at Ladywell Sanatorium (£192).—Maitland & Co.

Education Committee. Accepted :—
Electric lighting installations at Blackfriars Council School and West Liverpool Street Boys' School.—Ford Electrical Co., Ltd.

Electricity Committee. Accepted :—
Coal supplies for 6 months :—
2,000 tons Clifton Hall washed pea nuts (25s. per ton).—A. Knowles and Son, Ltd. 1,000 tons No. 2 washed slack (25s. per ton).—Clifton and Kersley Coal Co., Ltd. 1,000 tons Brackley washed slack (22s. 6d. per ton).—Bridgwater Wharves, Ltd. 1,000 tons Tyldesley washed Arley slack (23s. 1d. per ton).—J. Heaton.
Complete electric lighting installation at Agecroft power station (£1,857).—G. Hill & Co., Ltd.
Erection of static transformer sub-station in Rectory Road, Prestwich (£976).—J. F. Moore.

Forthcoming Events.

Diesel Engine Users' Association.—Friday, October 3rd. At the Engineers' Club, Coventry Street, W.1. Paper on "The Significance of Exhaust Temperature," by Mr. P. H. Smith.

Salford Technical and Engineering Association.—Saturday, October 4th. At the Royal Technical College. At 7 p.m. Lecture on "The Humidifier—Construction and Uses," by Mr. H. W. Gee.

Institution of Electrical Engineers (Western Centre).—Monday, October 6th. At the Merchant Venturers' Technical College, Bristol. At 6 p.m. Chairman's (Mr. W. Nairn) inaugural address.

Society of Engineers.—Monday, October 6th. At the Geological Society, Burlington House, London. At 5.30 p.m. Paper on "Pulverised Fuel," by E. Kilburn Scott.

Institution of Engineers-in-Charge.—Wednesday, October 8th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Paper on "The Testing of Aero-Engines in Flight," by Mr. R. J. Penn.

All-British Wireless Exhibition.—Open until October 8th. At the Royal Albert Hall, Kensington, S.W.

Junior Institution of Engineers.—Friday, October 10th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "The Design of Static Sub-stations, with some notes on their Equipment," by N. Thornton.

Notes.

Smokeless Fuel Plant at Glasgow.—The Glasgow Corporation has decided to install a five-unit battery of Maclaurin producers for the manufacture of smokeless fuel and the provision of gas to the Dalmarnock generating station. The decision has been taken after extensive experiments with similar plant, which have proved that a satisfactory smokeless fuel can be produced and sold at a price equivalent to that of coal, having regard to its calorific value, and that the gas produced can be used for firing steam boilers. The chief electrical engineer has reported that the cost of the gas will be no more than that of coal, and a great deal of expense will be saved in handling and other directions.

National Association of Supervising Electricians.—On Tuesday, October 14th, Mr. Frank Gill, M.Inst.C.E., M.I.E.E., will deliver his presidential address; Mr. P. M. Hindell will take the chair at 7.15 p.m.

Fire.—Damage estimated at £2,000 was caused by fire at the works of Mr. G. A. Rix, electrical engineer, Park Street, Keighley, on September 24th. The origin of the fire is unknown.

Glasgow Refuse Destructor Plant.—The ceremony of cutting the first sod in connection with the erection of a new refuse works for the Cleansing Committee of Glasgow Corporation took place on September 18th. The scheme will cost about £400,000. A special feature will be the utilisation of the refuse for the generation of electricity, and it is estimated that by this means 58,000,000 kWh will be generated per annum. The disposal of refuse at present costs £36,000, and in addition to saving that expenditure, it is stated that the utilisation of the refuse for generating electricity will mean the saving of 150 tons of coal per day.

Intense Magnetic Fields.—In a letter to *Nature* of September 20th, Dr. T. F. Wall, of Sheffield University, describes a method of producing very intense magnetic fields, a value of 400,000 gausses having been attained, whilst he expects to reach 1,500,000 gausses with a modified form of the apparatus. The method consists in discharging a condenser of large capacity through a solenoid of low resistance. Using a capacity of 700 mF, charged to a pressure of 1,850 volts, a current having a peak value of 12,500 amperes was passed through a solenoid wound with 25.5 turns per cm., producing the magnetic field intensity above mentioned.

Dr. Wall is reported to have stated that by the use of such powerful fields he hopes to be able to break up the atom and to control its energy. He regards the experiments as dangerous.

Local Society.—The programme of the Bradford Engineering Society for the 1924-25 session includes the reading of papers on the gas turbine, the "pass-out" steam turbine, high lift turbine pumps, the gyro compass, the scientific treatment of boiler-feed water, the "ultimate position of the single-phase motor in electric power distribution," and a number of other interesting matters. At the first meeting of the session, on Monday next, the president, Mr. L. Baldwin, will describe the Redcar steelworks and exhibit a film of the new electrically-driven plant at Messrs. Dorman, Long & Co.'s works at Middlesbrough and Redcar.

The Batti-Wallahs' Society.—This Society begins the new season with a re-union luncheon at the Hotel Cecil on Wednesday, October 8th, at 1 p.m. Advantage will be taken of this occasion to introduce to members gentlemen who have become Batti-Wallahs during 1924. The chief guest will be Mr. K. A. Scott Moncrieff.

Southern Railway Electrification.—The preparatory work for the electrification of the South-Eastern Section of the Southern Railway is proceeding satisfactorily. The running rails bonded as at September 24th amounted in length to 123 miles; 133 miles of conductor rail had been laid and 33 miles of this bonded. The laying of high-pressure cables had been carried out to the extent of 16 miles, and further h.p. and l.p. cables had been passed for delivery. Eighteen sub-station buildings were well in hand, the steelwork of seven of them having been completed. The manufacture of the sub-station plant was progressing and several converters were ready for test. A sample coach had been converted for electrical operation and sent to the contractors' works for equipment with motors and control apparatus. The value of contracts placed aggregated nearly two million pounds, and continuous work was being provided for over 2,000 men.

Appointments Vacant.—Clerk (£160) and storekeeper and meter tester and reader (75s.) for the Scunthorpe and Frodingham Urban District Council Electricity Department. Plumber-jointer for the Horwich Urban District Council Electricity Department. Armature winder (Rs. 325 per month) for the East Indian Railway Co. in India. (See our advertisement pages to-day.)

Fatality.—On September 27th, Frederick Timpson, an employé at the works of Messrs. Johnson & Phillips, Ltd., Charlton, was overcome by ground gas while working at the bottom of a shaft. He died after being taken to hospital, and two men who went to his assistance were badly affected.

Institution Notes.

Institution of Electrical Engineers.—The first London meeting of the 1924-25 session will be held on Thursday, October 23rd. The first meeting of the Wireless Section is announced for Wednesday, November 5th; and the first informal meeting for Monday, October 27th. The annual dinner is fixed for Thursday, February 12th. A preliminary date card has been issued for the session; particulars of the papers to be read will be announced later.

Institution of Rubber Industry.—This Institution began the meetings of its London and District Section on September 1st with a paper on "The Acidity of Raw Rubber," by Prof. G. S. Whitby. The programme of fixtures for the session, both in London (meeting place, the Engineers' Club) and in Manchester (meeting placé, the Textile Institute) has been printed and circulated.

Institution of Locomotive Engineers.—RAILWAY ELECTRIFICATION.—In an address delivered on September 25th by Lieutenant-Colonel E. O'Brien, of the London, Midland and Scottish Railway, before the Institution, it was claimed that gross savings amounting to approximately £21,000,000 a year on locomotive costs could be realised by the electrification of the main line railways of Great Britain. The lecturer said, according to *The Times*, that a careful review of the situation suggested that the electrification of main line railways in Great Britain was an immediate probability. Excluding the cost of fuel or of energy an economy of about 10d. per engine mile could be effected by substituting the electric for the steam locomotive. If this were not modified by other factors, it would represent an annual increase, probably £21,000,000, in net revenue if applied to the whole of the British railways. The five largest railway systems in Great Britain all had sufficient average densities of traffic to warrant a general scheme of electrification before amalgamation. It was probably capable of proof that the consequent net increase in revenue for an area extending at least 150 miles from London would be at least 5d. per engine mile. If the cost of electrical energy could be reduced to the level of that of fuel for steam locomotives, the ultimate electrification of the greater part of the British railway mileage would be assured. The capital cost of track equipment would have to be met, but the cost of replacement of the steam locomotives by electric locomotives did not affect capital expenditure. The cost of the change over would be borne by the renewal fund or be paid out of revenue, without diminishing the net revenue of the railway.

Institute of Metals.—The programme for the session, which commenced on October 1st, has just been issued, covering the work of the parent institute, and of its six branches. Over 30 important lectures dealing with various phases of non-ferrous metallurgy are enumerated, including the annual May lecture by the distinguished Dutch scientist, Prof. H. A. Lorentz. Copies of the programme can be obtained from Mr. G. Shaw Scott, M.Sc., 36-38, Victoria Street, Westminster.

Institute of Transport.—The first meeting of the 1924-25 session will be held at the Institution of Electrical Engineers, on Monday, October 6th. Sir Joseph G. Broodbank will open the proceedings and present the awards for 1923-24. Following his induction as President, Sir Lynden Macassey, K.B.E., K.C., will deliver his inaugural address, which will, in the main, deal with the London traffic problem. Applications for a visitor's card should be made to the Secretary at the offices of the Institute, 15, Savoy Street, London, W.C.2.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Mr. ERIC B. BAXTER, assistant traffic superintendent to Blackpool Corporation tramways, has been appointed traffic superintendent of South Shields Corporation tramways, and will take up the position in November. There were over 70 applicants for the position.

Mr. GEORGE WICKS is leaving the Electricity Department of the Bexley Urban Council to take up an appointment with a London firm of electrical engineers.

Mr. J. F. CAINE, assistant sales manager to Siemens and English Electric Lamp Co., Ltd., has resigned his position with the company to take up farming at Northover, Steyning, Sussex. Mr. Caine has been in the service of the company since the amalgamation in 1920 with the English Electric Supplies Co., with which he had been associated since its inception, and previous to that as director of the Britannia Lamp and Accessories Co., Ltd. On his resignation he was entertained at luncheon by the staff at the Holborn Restaurant, and was presented with a grandfather clock from the staffs in London, and with a solid silver candelabrum from the company's branches.

Mr. HARRY ALLCOCK, M.I.Mech.E., M.I.E.E., has joined the board of Messrs. Royce, Ltd., makers of electric cranes, capstans, motors, &c., of Trafford Park. Mr. F. Henry Royce will continue to act as consulting technical expert to the company. Mr. Allcock's long association with the cable-making firm of Messrs. W. T. Glover & Co., Ltd., remains unaffected by this further appointment. He is a vice-president of the Federation of British Industries and of the British Engineers' Association, and a director of the Manchester Chamber of Commerce.

On the occasion of his marriage, Mr. V. COCKLE, of the outdoor staff of the Kingston-on-Thames Corporation electricity works, has been presented by his colleagues with an electric kettle, an electric iron, and a coffee percolator.

The Council of the British Empire Producers' Organisation has elected officers as follows for the current year:—President: The Earl of Glasgow, D.S.O., R.N. Vice-presidents: The Hon. E. H. Armstrong, Prime Minister of Nova Scotia; the Hon. George Fairbairn, Agent-General for Victoria; the Hon. W. E. Dunning, Prime Minister of Saskatchewan. Chairman of Council: Mr. Ben H. Morgan. Vice-Chairman: Mr. V. A. Malcolmson, B.A., J.P.

Mr. F. H. BOND (Battersea borough electrical engineer) was successful in winning outright the Capel Morris Cup at the North Surrey Golf Club, of which he is vice-captain. The competition was over 36 holes against bogey, and although the cup has been in existence for very many years, Mr. Bond is the first member to win it on three occasions, thus acquiring it outright.

Dr. S. Z. DE FERRANTI sailed on September 27th by the *Aquitania* for a tour in Canada and the United States.

MR. W. A. HARRIS, for many years representing E. P. Allam and Co., has joined the staff of the City Electrical Co.

Mr. W. J. LINE, for some years chief of the design and inspection departments of Messrs. J. H. Tucker & Co., Ltd., Birmingham, has severed his connection with that firm and asks that communications should be sent to 59, Tennyson Road, Small Heath, Birmingham.

MR. STEPHEN O'SULLIVAN has resigned the position of engineer and manager of the Tullamore Electric Light & Power Co., and has been appointed engineer and manager of the Thurles U.D.C. electricity works. For some years Mr. O'Sullivan held the position of Admiralty electrical station supervisor. He was in charge of the generating station at H.M. Dockyard, Rosyth, and later at Portsmouth Dockyard.

Mr. J. R. CAHILL, the Commercial Counsellor to His Majesty's Embassy in Paris, will be visiting this country about the middle of October for the purpose of a short official visit. He will be in attendance at the Department of Overseas Trade from Monday, October 13th, till Friday, October 17th inclusive, for the purpose of interviewing (by appointment) British manufacturers and merchants interested in export trade to France. Mr. Cahill will subsequently visit a number of industrial centres in the United Kingdom.

Obituary.—Mr. W. Howard Tasker.—We regret to record the death, which occurred on September 17th, of Mr. W. Howard Tasker, M.I.E.E. Mr. Tasker, who was 67 years of age, was led to take up electrical engineering by his attendance at a lecture delivered in London by Graham Bell on the introduction of the telephone into England, in 1878. He became identified with the pioneer work of public electricity supply. He represented the School of Submarine Telegraphy at the first electrical exhibition at the Crystal Palace. He was preparing to go to a submarine cable station abroad in 1880 when he was offered, and accepted, the appointment of assistant electrician to the Yorkshire Brush Electrical Engineering Co., Ltd., at Middlesbrough, where he laid down and subsequently managed the first central lighting station, supplying electricity to the North Eastern Steel Works and group of blast furnaces, wharves, &c., over five miles of the West Marshes. While holding this appointment he was frequently called in to advise on the electrical schemes of various engineering works in the surrounding country. Returning to London, he was engaged on experimental work and the manufacture of incandescent lamps and storage batteries, and invented and patented improvements in the latter. He held positions in the following companies:—The Primary Battery Co., Ltd.; the Fitzgerald Electric Light and Power Co., Ltd.; the Union Electrical Light and Power Co., Ltd.; the Chelsea Electricity Supply Co., Ltd.; the New Gutta Percha Co., Ltd.; the Brush Electrical Engineering Co., Ltd. (as resident engineer carrying out the contract for the electricity supply at Dover); the British Westinghouse Electrical and Manufacturing Co., Ltd.; and the Hart Accumulator Co., Ltd. Owing to ill-health, Mr. Tasker had retired from active work for some years.

Dr. E. Batge.—The death is announced from Berlin of Dr. Ernest Batge, head of the wireless telegraphy department of the Siemenswerke in that city.

New Companies Registered.

Technical Advisory and Research Bureaux, Ltd. (200,646).—Private company. Registered September 26th. Capital, £1,000 in 800 "A" shares of £1 each and 4,000 "B" shares of 1s. each. To carry on the business of technical consultants, expert advisers, consulting engineers in all branches of engineering, technical and industrial efficiency, to advise and assist in all matters of civil, mechanical, electrical, chemical and other forms of engineering, &c. The subscribers (each with one "A" share) are:—W. Fowell, 4, Bentham Road, South Hackney, E.9, solicitor's managing clerk; G. Boggis, 7, Hornsey Lane Gardens, Highgate, N.6, clerk. The first directors are not named. Qualification, £100 shares. Secretary: S. Landman. Solicitor: S. Landman, Sentinel House, Southampton Row, W.C. Registered office: 14, Victoria Street, S.W.

Clay Cross and District Electric Supply Co., Ltd. (200,635).—Private company. Registered September 26th. Capital, £5,000 in £1 shares. To adopt an agreement between the Clay Cross Co., Ltd., of the one part, and T. H. Jackson and G. M. Jackson of the other part, and to carry on the business as indicated by the title. The permanent directors are:—T. H. Jackson, The Manor House, Birkenhead, colliery proprietor; G. M. Jackson, Clay Cross Hall, near Chesterfield, general manager. Qualification: £500 shares. Secretary: J. Steen. Solicitor: G. H. Slack, Clay Cross.

Robins, Ltd. (200,556).—Private company. Registered September 22nd. Capital, £1,000 in £1 shares. To carry on the business of electrical, radio and mechanical engineers and contractors, suppliers of light, heat, sound and power, ironfounders, toolmakers, brassfounders, metal workers, &c. The subscribers (each with one share) are:—R. W. Robins, "Walbrook," Cyn Coed Road, Penylan, Cardiff, consulting engineer; J. F. Gumm, 30, Romilly Road, Cardiff, clerk. The subscribers are to appoint the first directors. Remuneration as fixed by the company. Secretary (*pro. tem.*): J. F. Gumm. Solicitor: J. T. Phœnix, Dumfries Chambers, 8, Dumfries Place, Cardiff. Registered office: 119, Queen Street, Cardiff.

Secret Wireless, Ltd. (13,322).—Private company. Registered in Edinburgh September 18th. Capital, £10,000 in £1 shares. To carry on the business of manufacturers of all or any of the instruments and accessories relating to or in connection with the inventions or systems of John Doig Chisholme, electrical engineer, for the secret transmission or reception of telephonic or other wireless messages, with or without relaying stations, &c. The subscribers (each with one share) are:—E. Dunholm-Young, 15, Rutland Street, Edinburgh, W.S.; J. D. Chisholm, 102, Great Russell Street, London, W.C.1, engineer; C. S. Sarle, 8, Shoe Lane, London, E.C., author and journalist. J. D. Chisholm is managing director. Solicitors: Dunholm-Young and McVittie, 15, Rutland Street, Edinburgh. Registered office: 15, Rutland Street, Edinburgh.

G. E. Millner & Co., Ltd. (200,534).—Private company. Registered September 20th. Capital, £1,000 in £1 shares. To carry on the business of electrical, mechanical, automobile and general engineers, manufacturers and importers and exporters of and dealers in radio and electrical instruments, transformers, radiators, dynamos, motors, electric lighting, starting, power and transmission plant, motor lamps, automobiles and accessories, &c. The subscribers (each with one share) are:—V. Deighton, 1, Willifield Parade, Golders Green, N.W.11, solicitor's clerk; P. H. Blackman, 26, Glaslyn Road, Crouch End, N.8, solicitor's articled clerk. The first directors are to be appointed by the subscribers. Qualification: 1 share. Remuneration as fixed by the company. Solicitors: Arthur Blackman, Hailey and Co., Gresham House, Old Broad Street, E.C. Registered office: 28, Cheapside, E.C.

Risborough and District Water and Electricity Supply Co., Ltd. (200,609).—Public company. Registered September 24th. Capital, £6,000 in £1 shares. To carry on at Princes Risborough and Saunderton and elsewhere the business of a water works and electric light company, &c. Minimum cash subscription, £7. The first directors are:—S. Read, Saunderton, Princes Risborough, Bucks.; D. C. Way, Culverton, Princes Risborough, Bucks. Qualification: £500. Solicitor: A. J. Clarke, High Wycombe.

Dayzite, Ltd. (200,590).—Private company. Registered September 24th. Capital, £5,000 in £1 shares. To acquire from Will Day, Ltd., the trade mark or name of Dayzite, and to carry on the business of dealers in wireless, kinematograph, phonographic, musical and theatrical apparatus, &c. The subscribers (each with one share) are:—Wilfred E. L. Day, Hollydene, 15, Cholmeley Park, Highgate, N.6, kinematograph expert; Horace L. V. Day, Hollydene, 15, Cholmeley Park, Highgate, N.6, wireless engineer. Will Day is first governing director, with power to appoint not more than three other directors. Solicitors: Firth and Firth, 31, Bank Street, Bradford. Registered office: 19, Lisle Street, Wardour Street, W.1.

Stenocode Exploitation Syndicate, Ltd. (200,603).—Private company. Registered September 24th. Capital, £1,000 in 400 "A" and 600 "B" shares of £1 each. To adopt an agreement with Angelo Cipiano Baronio, to acquire letters patent No. 186,670, of 1921 (not described), and to carry on the business of experts in, advisers on and teachers of the art of condensing matter intended for transmission by cable or by telegraphy, proprietors, inventors, compilers and adapters of or advisers on telegraphic codes, &c. The first directors are:—H. G. Telling, 153, Perrymale, Forest Hill, S.E.11; S. J. Williams, 113, Hamlet Gardens, Ravenscourt Park, W.6; S. St. J. Steadman, 18, Alexandra Mansions, 347, West End Lane, N.W.6. Solicitors: Steadman, Van Praagh and Gayler, 4, Old Burlington Street, W.1. Registered office: Sardinia House, Sardinia Street, Kingsway, W.C.

G. Hands & Co., Ltd. (200,396).—Private company. Registered September 13th. Capital, £1,000 in £1 shares. To adopt an agreement with G. Hands, and to carry on the business of electrical, gas, hydraulic, sanitary, mining, mechanical, civil and motor engineers, founders, smiths, machinists, carriers, &c., formerly carried on by the vendor at 69-71, Farringdon Road, E.C., as "G. Hands & Co." The permanent directors are:—H. H. Bromley, Gartrell, Addlestone, Surrey (chairman and managing director); Mrs. F. M. Boult, 48, Boston Road, East Ham; H. L. Sheppard, "Haroldene," 239, Victoria Road, Alexandra Park, N.22 (sales director); A. S. Hands, 8, The Hawthorns, Moseley, Birmingham (sales director). Qualification of permanent directors: 100 ordinary shares; of ordinary directors: £150. Remuneration: £25 per annum divided between them. Secretary: Mrs. F. M. Boult. Solicitor: H. Anderson, 140, Temple Chambers, E.C.4. Registered office: 67, Farringdon Road, E.C.1.

Capart-Dubilier, Ltd. (200,541).—Private company. Registered September 22nd. Capital, £10,000 in £1 shares. To carry on the business of electricians, mechanical engineers, manufacturers of electrical condensers, electrical, wireless, and high-tension protective apparatus, &c. The subscribers (each with one share) are: A. C. Banks, 21, Woodland Road, New Southgate, N.11, managing clerk; Gertrude A. Mears, Aldwych House, Aldwych, W.C.2, clerk. The subscribers are to appoint the first directors. Remuneration as fixed by the company. Solicitors: Arthur Veasey & Co., Aldwych House, Aldwych, W.C.2.

"Qualitas" Electric Co., Ltd. (2,362F).—Particulars were filed on September 20th, pursuant to Section 274 of the Companies (Consolidation) Act. The capital is 20,000 fr. in 20 shares of 1,000 fr. each. The company was incorporated in Basel (Switzerland) to manufacture and sell electrical specialities, &c. The British address is Fulwood House, High Holborn, W.C.1. V. Baumgartner, of 14, Nevern Place, Kensington, S.W.5, and Margaret Shankland, of 5, Brunswick Square, Bloomsbury, W.C.1, are authorised to accept service of process and notices on behalf of the company. V. Baumgartner is sole director.

Chirk Electricity Supply Co., Ltd. (200,607).—Registered September 24th. Capital, £5,000 in 10s. shares. To adopt an agreement with the Chirk Gas Co., Ltd., and its liquidator, and to carry on the business of an electric light supply and power company, &c. Minimum cash subscription, £1,000 shares. The first directors are:—A. Wood, Bryn Coed, Chirk; J. Powell, Lynsden, Chirk; E. T. Davies, Preesgweene Hall, Weston Rhyn; W. Parker, Plasywaen, Chirk; T. Woods, Chirk Castle, Chirk; A. Rennie Gamble, 283, Belgrave Gate, Leicester; E. Evans, Dolywern, Pontfadog. Qualification, £50 shares. Secretary: W. G. Lloyd, 8, West View, Rhos-y-Waen, Chirk.

City Notes.

The French Cable Company.

The report of the *Compagnie Francaise des Cables Telegraphiques* states that despite the reduction in the transatlantic rates in March, 1923, the receipts from the traffic in that year were substantially the same as in the previous year, namely, 18,175,000 fr., as against 18,363,000 fr. in 1922. The net profits amounted to 5,445,000 fr. as compared with 4,526,000 fr., and the dividend has been fixed at 24.95 fr. per share. The directors state that in continuation of the programme of improvement, the company introduced automatic relays last year at the stations at Cap Cod and Saint-Pierre, thus permitting the Brest station to work with that in New York without any manual retransmission. During the year the company continued to operate the cable Brest-Azores-New York for the account of the States. In the case of the cable between Australia and New Caledonia, the company continues to represent to the Government that it will only be able to resume the service of this cable after having obtained financial guarantees sufficient to ensure working, without loss, of a means of communication which is unproductive.

German Electrical Companies.

The Lloyd Dynamo Works Company, of Bremen, proposes to carry forward the paper profits earned last year, in anticipation of the preparation of a balance sheet on a gold mark basis.

The Robert Bosch Co., of Stuttgart, reports that the external organisation was further developed systematically in 1923, and new representations were opened in various countries. The net profits in paper marks have been carried forward.

Direct West India Cable Co., Ltd.—The credit balance for the year ended June 30th last was £11,249, and to this was added £23,574 brought forward, making £34,823. After providing for the interim dividend, &c., there remained a balance of £31,026. The final dividend is 5 per cent., free of tax (making 10 per cent., tax free for the year), and a balance of £28,026 is carried forward.

International Automatic Telephone Co., Ltd. — The directors have decided to issue 144,605 ordinary shares to existing shareholders at the price of 20s. 6d. each.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted:—

Pennsylvania Water and Power Co.—9,709 shares of capital stock of $100 each.

British Insulated & Helsby Cables.—£515,602 5 per cent. mortgage debenture stock fully paid. (Conversion stock.)

Dealings in the following have been specially allowed by the Committee:—

Traction and Power Securities Co.—£35,457 4½ per cent. debenture stock.

International Automatic Telephone Co.—144,605 new ordinary shares of £1 each, issued at £1 0s. 6d., partly paid and fully paid, Nos. 215,396 to 360,000.

Stothert and Pitt.—7,500 ordinary shares of £1 each, fully paid, Nos. 184,086 to 191,585.

Thos. W. Ward, Ltd.—The profit for the year ended June 30th last was £126,988, and to this was added £17,693 brought forward, making £144,681. It is proposed to place £25,000 to reserve, to pay a final dividend at 6¼ per cent. (making 10 per cent., tax free, for the year) on the old ordinary shares, to distribute 10 per cent. on the new ordinary shares, and to carry forward £29,313.

Belgian Properties in Russia.—*La Société des Tramways et Applications Electriques*, at the recent shareholders' meeting in Brussels, reported that its electric lighting and tramway undertakings in the towns of Sebastopol, Krementchong, Jaroslaw, and Ekaterinodar, were in the hands of the Soviet authorities, who were working them on their own account. As in the case of all other foreign enterprises in Russia, no date can be fixed when the company will regain possession of its properties. In order, however, to protect its rights and press its claims, the company, in conjunction with the various banks interested in it, has organised a special financial syndicate to provide the necessary funds.

Halifax and Bermudas Cable Co., Ltd.—The credit balance for the year ended June 30th last was £21,654, as compared with £22,594; to this was added £31,297 brought forward, making £52,951. After providing for repairs, interim dividend, depreciation, &c., a disposable balance of £46,126 remained, and a final dividend of 5 per cent., free of tax (making 10 per cent. free of tax) is being paid, and £43,626 carried forward.

Prospectus.—Last week the prospectus was published in connection with the issue of a loan amounting to £400,000 by the City of Auckland. The proceeds of this loan, which is issued at £97 10s. per cent., and bears interest at the rate of 5 per cent., are to be devoted to municipal works, including street improvements, tramway and waterworks extensions, &c.

Manila Electric Corporation.—A meeting of stockholders is to be held in Connecticut on November 10th to consider a proposal to convert the existing common stock of 100,000 shares of $100 each into 400,000 shares of no par value, the new shares to be issued at the rate of four to each old share held.

Shawinigan Water and Power Co.—At a recent meeting of the shareholders it was decided to increase the capital to $35,000,000 by the issue of $2,000,000 stock at par on the basis of one share to every ten held by existing shareholders.

Paisley District Tramways Co.—It is announced that all liabilities and debts have been discharged, and that a final distribution is to be made to the ordinary shareholders, after which steps will be taken for the dissolution of the company.

Direct Spanish Telegraph Co., Ltd.—Dividend for the half-year to June 30th, 1924, at the rate of 10 per cent. per annum on the preference shares, an interim dividend of 4 per cent., free of income tax, on the ordinary shares.

Browett, Lindley & Co., Ltd.—Owing to trade depression, no interim dividends are being paid on the preference or ordinary shares.

Shanghai Electric Construction Co., Ltd.—An interim dividend of 6 per cent. (actual) has been declared on the old share capital (as in 1923).

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange markets are enjoying a good deal of business. The second half of the financial year of the House makes a useful start, there being a readiness on the part of the public to employ money in many directions. Mining shares attract no attention, but industrials, and all the sound investment stocks find ready support. The journalistic war which is going on in regard to trade, one paper crying bull and another paper crying bear, interests the House in a good many ways. Members know and appreciate that, if the trade of the country were really as good as it is represented to be in some quarters, there would certainly not be the money available for employment in stocks and shares, which money the House finds to be flowing into its markets.

Holders of London electricity supply shares find that the long suspense in regard to the future of the industry is beginning to tell a little upon their nerves. For this reason, people are asking whether it is right to sell shares in the London group, in view of the high quotations which still obtain in the market, and considering the uncertainty that surrounds the matter of the companies' future. It may be recalled once more that the whole matter was postponed until the end of October, when it is again to be dealt with, and in such manner as is likely to bring it to a final decision. After the many years of hard work and what, without exaggeration, may be called unremitting toil on the part of those who have skilfully piloted the electricity supply industry to its present prosperous stage, it would seem to be almost impossible for failure to attend upon the effort that has been directed towards the establishment of the London companies upon a basis which, to the present generation at any rate, would mean a permanency. The questions at issue have been fined down to narrow points, but shareholders in the companies recognise the political tendencies of the day, and these arouse a certain measure of uneasiness. Prices in the market for the various shares are well maintained, as our weekly price-lists illustrate, but brokers get a good many inquiries as to whether their clients ought to sell, and these inquiries, it may be added, come mostly from people who, if they realised at the present time, could do so at prices materially better than those which they paid for their shares. Per contra, it is known that the present year will be an exceptionally good one for the industry, and substantial dividends are assured, the probability pointing to increases even upon the splendid results achieved in 1922 and, still more, in 1923. No changes have occurred in the prices of London shares. The three Newcastle-on-Tyne issues are ex dividend and have recovered part of the deductions. Whitehall Electric old and new preference at 19s. 3d. x.d. are now all alike. Bournemouth and Poole have risen to 2 7/16. Midland Electric ordinary are better at 21s. 6d.

The Home Railway market is slightly irregular. Metropolitans have fallen to 76, though Undergrounds are better, the £10 ordinary shares showing ¼ rise at 2¾ and the "A" shares strengthening to 8s. London Traction issues are steady. Prices are maintained at their previously advanced levels, but no further variations occurred.

In the foreign group, Brazil Tractions, after being better, eased off to 55, leaving them unchanged on the week. There are vague rumours afloat as to the recurrence of revolutionary trouble at Para, and these have served to depress Brazilian Government bonds, although the Railway and Utility stocks connected with the country have not suffered to any noticeable extent. Mexicans are buoyant. Mexican Light and Power preferred shares at 58 show a gain of 6, on top of their 5 points rise of last week. The common shares have risen to 25 and the company's first mortgage bonds at 63 are 5¼ points higher than they stood a fortnight ago. Rises of about 5 points apiece occurred in the bonds of the Mexico Tramways Company. The reason for these apparently startling improvements is to be found in the revival of the many-times-repeated story concerning the willingness of New York to lend Mexico money for the purpose of developing the latter country. The Utility companies are, so far as can be ascertained, doing tolerably well. Some of the buying of the bonds is certainly traceable to American sources. British Columbia preferred stock strengthened to 85¼. British Electric Traction preference is better at 102¼ and the company's debenture at 96¼ shows a gain of a point.

The United States is a persistent buyer of Radio common shares, the price having been taken up to 5¼. The preferred are rather better at 10⅞ bid. Marconis at 33s. 9d. have 1/16 rise to their credit, and Canadian Marconi at 7s. 3d. look a little stronger market than they have done of late. In the cable group, Great Northerns are again the outstanding feature with a rise of 15s. to 29¼, for the reason stated here last week. Cuba Submarines have recovered the dividend of 5s. just deducted. There are no alterations, except those caused by ex dividend markings, in the Eastern group.

Edisons have risen to 5s. 3d.; though, on the other hand, English Electrics are dull at 17s. 3d. and General Electrics at 17s. 9d. A good deal of activity in Automatic Telephone new shares is the feature in this department. The price of these shares, offered by the company at 21s. 6d., is 5s. premium. The International Automatic Telephone Company is also offering new ordinary shares at 20s. 6d., and the price of these rights is 3s. premium. It may be politely impressed upon shareholders in both these companies that they should make a particular point of seeing that they get the advantage which such premiums offer, because, if it is not desired to take up the new shares, they can be sold and transferred on the letters of renunciation furnished by the companies. The Automatic Telephone new shares are likely to go better, and the new Internationals at 2⅞s. 6d. present scope for improvement.

The rubber share market is stronger, owing to the visible stocks showing another decline of 1,900 tons for the past week. Iron and steel shares are also a firmer market, the reviving interest of the public for industrial shares serving to draw attention to engineering and allied issues as useful to lock up, against the time when general trade throughout the country shall obviously improve.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1922.	1923.	Price Sept. 29, 1924.	Rise or fall.	Yield. p.c.
Brompton Ordinary	1	12	10	37/-	—	*£5 8 1
Charing Cross Ordinary	1	14	14½	2⅛	—	7 3 0
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	10	12	33/3	—	6 12 7
City of London	1	15	15	46/3	—	6 9 10
do. do. 6 % Pref. ...	1	6	6	23/-	—	5 2 2
County of London	1	10	15	46/-	—	6 10 4
do. do. 6 % Pref. ...	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	5	—	4 4 10
do. 6 % Pref.	5	6	6	5½	—	5 9 1
Kensington Ordinary	5	12	14	9⅜	—	7 9 4
London Electric	1	10	10	30/6	—	6 11 4
do. do. 6 % Pref. ...	5	6	6	5½	—	5 14 3
Metropolitan	1	8½	10	1 1/16	—	5 18 6
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary ...	1	2½	6	20/9xd	—	5 15 8
do. 5 % Pref. ...	1	5	5	17/-xd	—	5 17 8
do. 7 % Pref. ...	1	7	7	25/-xd	—	5 12 0
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	1⅛	—	5 6 8
Urban Ordinary	1	—	4	19/3	—	4 4 8
do 6 % Pref. ...	1	5	6	1	—	6 0 0
St. James' and Pall Mall ...	5	14½	17½	12½	—	7 4 5
South London	1	11	15	43/3	—	6 18 7
South Metropolitan Pref. ...		7	7	1 2/32	—	5 12 0
Westminster Ordinary	5	12	15	10	—	7 10 0
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	19/3xd	—	7 16 0

Home Rails.

Central London Ord. Assented	Stock	4	4	69½	—	5 15 2
Metropolitan	,,	3½	4	76	—1	5 5 8
do. District	,,	3	3½	50½	—	6 18 0
Underground Electric Ordinary	10	Nil	Nil	2½	+ ¼	Nil
do. do. "A" ...	1	Nil	Nil	8/-	+6d.	Nil
do. do. Income	Bonds	5	6	96	—	*6 5 0

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	23½	—	6 6 4
Chile Telephone	5	6	6	5⅜	—	5 11 7
Cuba Sub. Ord.	10	7	7	7xd	+ ¼	10 0 0
Eastern Extension...	10	10	10	16⅛	—	6 4 0
Eastern Tel. Ord.	Stock	10	10	162½	—	6 3 1
Globe Tel. and T. Ord. ...	10	10	10	17½xd	—	5 16 9
do. do. Pref. ...	10	6	6	11½xd	—	5 7 0
Great Northern Tel.	10	24	28	29½	+ ½	7 9 2
Indo-European	25	7	7	32½	—	*5 6 1
Marconi	1	15	10	1 1/16	+ 1/16	5 18 6
Oriental Telephone Ord.... ...	1	12	12	1 1/16	— 1/16	*6 12 7
United R. Plate Tel.	5	8	8	6⅞	—	*5 18 6
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	15⅝xd	—	6 8 1

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	12½	5½	8 7/16	—	8 0 0
do. do. 2nd Pref. ...	5	5½	6	8½	—	9 4 8
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16
British Electric Traction Ord. ...	,,	5	6	94½	—	6 7 0
do. do 6% Pref. ...	,,	6	6	102½	+1	5 18 3
Brazil Traction	100	4	4	55	—	7 5 6
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	87½	—	5 14 3
do. do. Preferred	,,	5	90/-	85½	+1	*5 12 6
do. do. Deferred	,,	8	129.5	105½	—	*6 3 3
do. do. Deb.	,,	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5 % Pref. ...	1	5	2½	8/-	—	6 5 0
London United Tram. Deb. ...	Stock	4	4	55½	—	7 4 2
Mexico Trams. 5% Bonds ...	—	Nil	5	73	+5	6 17 0
do 6% Bonds ...	—	Nil	Nil	53	+4½	Nil
Mexican Light Common ...	100	Nil	Nil	25	+1	Nil
do. Pref.	100	Nil	Nil	58	+6	Nil
do. 1st Bonds ...	—	5	5	68	+3	7 7 1

Manufacturing Companies.

Babcock & Wilcox...	1	20	12	46/3	—	*5 4 0
British Aluminium Ord.... ...	1	5	5	23/9xd	—	4 4 3
British Insulated Ord.	1	15	15	55/-xd	—	5 9 1
Callenders	1	15	15	55/-	—	5 9 1
do. 6½ Pref....	1	6½	6½	23/9	+6d.	5 9 5
Crompton Ord.	1	5	Nil	7/16	—	8 17 10
Edison-Swan	4/-	7½	—	5/3	+6d.	5 14 3
do. ,, 5% Deb.	Stock	5	5	71½	—	6 19 10
Electric Construction	1	10	10	1 7/8	—	6 19 0
English Electric	1	8	8	17/3	—3d.	5 16 0
do. do. Pref.	1	6	6	19/6xd	—	6 8 1
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
do. Ord.	1	5	5	17/9	—3d.	5 12 8
Henley	1	15	15	55/-	—	5 9 1
do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	16/3	—	*6 8 1
Met.-Vickers Pref....	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	5	—	1	—	5 0 0
Telegraph Con.	10	20	20	21½	+ ½	*4 16 7

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price Sept. 30.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5½d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£35	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	4½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ... ,,	£7 15s.	...
a ,, Roll ... ... ,,	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4½d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£125 to £130	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net	£216	...
Grade II ... ... ,, ,,	£156	...
Grade III ... ... ,, ,,	£90	...
c Brass (rolled metal 2" to 12" basis) per lb.	9¼d.	...
c ,, Tubes (solid drawn) ... ,,	11½ to 1/-	½d. dec.
c ,, Wire, basis ... ... ,,	10½d.	...
c Copper Tubes (solid drawn) ... ,,	1/1	½d. dec.
c ,, Bars (best selected) ... per ton	£92	£3 dec.
c ,, Sheet ... ... ,,	£92	£1 dec.
c ,, Rod ... ... ,,	£92	£1 dec.
d ,, (Electrolytic) Bars ... ,,	£66 5s.	30s. dec.
d ,, ,, Sheets ... ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£76 5s.	35s. dec.
d ,, ,, H.C. Wire per lb.	9⅞d.	⅛d. dec.
f Ebonite Rod ... ... ,,	2/- to 3/6	...
f Sheet ... ... ,,	2/- to 3/6	...
a German Silver Wire ... ... ,,	2/3	...
h Gutta-percha, fine ... ... ,,	3/6	...
h India-rubber, Para fine ... ,,	1/2½	½d. inc.
Iron Pig (Cleveland Warrants) ... per ton.	£5 2s. to £5 2s. 6d.	...
f ,, Wire, galv. No. 8, P.O. qual. ,,	£25	...
g Lead, English Pig ... ... ,,	£34 5s.	5/- inc.
g Mercury ... ... per bot.	£11 15s. to £12	10/- dec.
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/3½	...
p ,, ,, wire ... ... ,,	1/8½	...
o Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0½	...
r Steel, Magnet, in bars ... ... ,,	8d.	...
n Tin, Block (English) ... ... per ton.	£240 5s.-£240 15s.	£7 10s. to £7 15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Electrical Standardisation in Australia.—The Electrical Sectional Committee on Engineering Standardisation in Australia is representative of a wide range of interests, including technical institutions, Government departments, insurance companies, tramway and electricity undertakers, large power users, and manufacturers. The work is of such a magnitude that it has been considered advisable to divide the committee into two sections, one at Sydney under the chairmanship of Mr. O. W. Brain, chief electrical engineer to the N.S.W. Railway Commissioners, representing New South Wales and Queensland; and one at Melbourne, representing Victoria, South Australia, Western Australia, and Tasmania, under the chairmanship of Mr. H. R. Harper, chief electrical engineer to the Victorian Electricity Commission. Sub-committees have been appointed to study such matters as electrical machinery, electric lamps, power cables, accessories, telegraphs and telephones, traction, prime movers for electrical plant, switchgear, instruments, cooking and heating, nomenclature, &c.

Vocational Training on Discharge from the Navy.—In connection with the scheme of vocational training adopted for the benefit of men becoming due for discharge from the Royal Navy, increasing attention is being paid to the possibilities of openings for electricians. Certificates granted to successful candidates at the annual examination of the City and Guilds of London Institute, it is pointed out in naval orders issued at Portsmouth, are of great assistance to ratings in obtaining electrical employment on leaving H.M. service, and to assist men in preparing for this examination voluntary courses are now being commenced at the Vernon Torpedo and Mining School in electrical engineering and electrical installation work.

Power Transmission Lines: Aspects of their Design.—IV.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E., Fel.Am.I.E.E.

(Continued from page 463.)

Due chiefly to atmospheric conditions in this country, wood pole construction is in special favour, and the preference for wood poles and structures will no doubt continue until their annual cost or their first cost become relatively excessive as compared with the modern designed line-support of steel or of the reinforced-concrete type. In areas where climatic conditions tend badly to rot, effective treatment and proper setting of wood line-supports is very necessary to reduce renewals, and in areas where the atmosphere tends badly to corrosive action all the galvanizing of metal line-supports should be properly painted with a preservative compound to avoid excessive cost of maintenance and renewals. Painting of steelwork is highly important in a salt-laden atmosphere. Under certain atmospheric conditions, iron and steel require more careful protection from corrosion and rust than under other conditions and circumstances; the amount of corrosion will also depend on the grade of steel used. High tensile steel tends to corrode more quickly than either mild steel or wrought iron. If iron and steel line-supports are regularly and carefully examined and painted periodically, the cost of maintaining and preserving them will be low, and their destruction by the action of air, moisture and water will be delayed. The tubular pole is subject to rust and corrosion both internally and externally. Poles of the lattice type are often made up of too many parts not easily get-at-able with the paint brush when the pole is completely assembled; a well-designed mild-steel lattice pole consisting of the smallest number of parts has many advantages over nearly all other kinds of poles. Usually a well made reinforced-concrete pole and a concrete foundation ensure the lowest maintenance expense. Where iron or steel is used, the strength of the metal set into concrete is greater than the strength of the same line-support buried in the ground. A concrete foundation raised above the ground surface or water level prevents rot, rust and corrosion at a point which generally controls the length of life and/or number of renewals, *i.e.*, that part of the line-support located at or just below the ground level.

In making a determination of the most economical line-support, it is first necessary to prepare estimates showing comparative costs of line-supports of different kinds, the cost of insulators, of cross-arms and other necessary line materials; and of the comparative annual costs; when this has been done, then determine the total first cost per mile of line for different span lengths. The cost of line-supports will vary with the span length, *i.e.*, the number of line-supports; the latter is also dependent on the number of angles in the line. The cost also varies with the vertical effective height of the line-support; the latter is controlled by such factors as the height of the points where the resultant forces would apply, and consists of a minimum height that is independent of the voltage, of the span-length, and spacing for voltage and sag of conductors, also the height that depends on the voltage, and that due to the square of the span length. The total height consists of the length between the top of the line-support and the lowest cross-arm; the sag of conductors less the length of pin (using pin-type insulators) or the sag of conductors plus the length of the string of insulators (using the suspension type insulator); the ground clearance of the lowest conductor at the centre of the span; and the depth of line-support set or buried in the ground. The length of the line-support will also vary with the arrangement of the line-conductors, *i.e.*, whether vertical or horizontal. Advantages from certain viewpoints favour the latter arrangement of conductors. As regards the former, in regions subject to ice-coating of conductors the vertical arrangement has been the cause of numerous service interruptions when the ice begins to break away, &c.; however, with a slight change from the vertical (assuming a double circuit three-phase line), the line inductive reactance can be reduced by a proper order of phases on each side of the line-support.

With respect to a wood line-support, this should be installed so that it has a definite factor of safety at the time of installation; then, when the rot has penetrated a certain depth—leaving firm wood sufficient to give the minimum strength—the support should be replaced. In practically every case the principal point of decay of line-supports occurs just below the surface of the ground. Too often wood poles are renewed after they have caused damage or interruption of service; in all cases they should be removed and renewed whenever the *surplus available* strength falls below a certain specified value, which should be that strength necessary to carry the estimated or assumed safe load. Using up the total available or safe strength of a wood pole does not necessarily mean the end of the pole, as the total life of a pole may include many renewals, provided its length is satisfactory for the service required of it. So very many variables enter into the useful life of wood, iron and steel line-supports that reliable data giving length of life for different kinds of material and types subjected to the best treatments and for different settings used in different localities and atmospheres should prove valuable, and would more or less indicate the kind of material and type of support to best serve any particular region or locality. In determining the size of line supports for any given case—with special reference to the wood pole or structure—surplus available length and strength should be provided; this is especially so in the case of distribution lines, where, apart from decay, greater loading, &c., on the structures can be expected. In general, this practical condition clearly indicates a wide margin between the present loading and size of pole and the probable future loading and required size of pole. Good practice aims to satisfy the latter condition.

From time to time the conditions affecting both conductor and line-support loading have been subjected to much comment. Up to recently in this country the condition of loading was specified as 25 lb. per sq. ft. of effective area (previously 30 lb.) without ice. For the latter figure (30.0 lb.) and for the more common sizes of bare aerial copper conductor, the load conditions imposed are less than loadings based on 8.0 lb. per sq. ft. plus ½ inch radial ice-coating, hence a greater factor of safety could be allowed for the *old* code; that is to say, taking a No. 1/0 L.S.G. bare hard-drawn copper wire, the horizontal wind load in lb. per lineal ft. plus ½ inch ice, is 0.878 lb.; for 30.0 lb. without ice the load is 0.81 lb. Also, for a No. 3 L.S.G. bare hard-drawn copper wire, taken on the basis of 30 lb. per sq. ft. ton the conductor *only*) the horizontal wind load per lineal ft. is 0.63 lb., but for 8.0 lb. per sq. ft. and ½ inch ice, the load is 0.83 lb. per lineal ft of conductor. In general it is the total resultant load which is required to be known, and this involves the application of a factor of safety; for instance, let the breaking stress or ultimate strength* of No. 1/0 L.S.G. bare hard-drawn

* Taking the ultimate strength of bare hard drawn copper wire at 55,000 lb. per sq. inch, then, for this size of conductor the ultimate strength is 55,000 × 0.08245 = 4,534 lb. The *new* code specifies 24 tons (24 × 2,000 = 48,000 lb.); then 48,000 × .08245 = 3,958 lb.

copper wire equal 4,534 lb. (see Chart No. V), then, using a factor of safety of 2.0, we have $4,534/2 = 2,265$ lb. permissible or allowable strength or total resultant load. For a 25 lb. loading without ice, a greater factor of safety can be allowed, due to the decreased loading conditions. Chart No. V will be found interesting as showing, at a glance, the relative stress values for different conditions of copper conductor loading.

Now that ice-coated conductors form part of the regulations, it is of importance when summing up general conditions affecting loadings to keep in mind some of the principal points which have proved that the design of line-supports (wood line-supports) played far too much for safety or accepted inaccurate base data. In some cases this has been due to basing the design on indicated instead of actual wind velocity, using too high a factor of safety, allowing for too great an ultimate strength, and/or specifying heavy sleet with a high wind pressure. In this respect it should be noted that: (1) maximum wind velocity rarely occurs simultaneously with a maximum sleet load; (2) heavy sleet will not form when the wind pressure is high; (3) stranded conductors will collect snow quicker and will hold it longer than solid conductors; (4) for equal conductivity (which is the commonly accepted basis of comparison) aluminium conductor will collect much more ice and snow than copper conductor, as the radial surface is very much larger, &c.; (5) for equal size of copper and aluminium conductors, the aluminium conductor will usually (or more often) be stranded and the copper conductor solid, and therefore will be comparatively heavier for equal sectional area and will collect snow quicker and retain it longer than a solid copper conductor*; (6) actual wind velocities and not indicated wind velocities should be used—the latter velocities will demand a more costly and much stronger line-support; (7) it is improbable that maximum winds will occur over every foot of long spans or so frequently as to make it desirable to impose excessive loadings; (8) ice breaks from conductors when subjected to high wind pressures—this is particularly so when ice is combined with snow; (9) only on very special occasions is it necessary to design so as to withstand more than ½ inch of radial ice; in this country lines will rarely if ever be subjected to ½ in. ice-coating on the conductors.

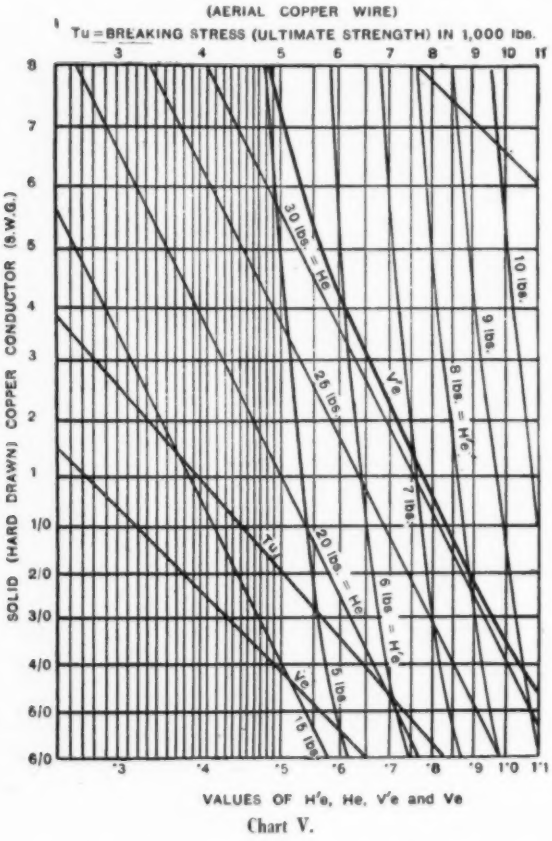

Chart V.

In pole-line design for overhead power lines, the principal object in view is to determine the effective safe transverse load strength and length of line-support required, and when this information has been obtained, the calculated values are then compared with the standard commercial pole and structure sizes and strengths (supplied by manufacturers and dealers from lists of tested poles and structures) and the nearest standard size and length of line-support chosen, in a similar way as is done in the case of looking up the ohmic resistance or length, &c., values for the size of line-conductor. In the case of untested line-supports there is always much doubt, and wood poles and structures are no exception; the uncertainty and/or weakness of designs, as also the belief that every pole (wood pole) of a given class has the same strength for equal dimensions, are more often the principal causes of trouble and failure. For these reasons the next larger "stock" size of line-support is more often selected. To simplify calculations for the determination of strengths of line-supports and/or loadings (coming within the new ratings), the four accompanying charts are presented. Chart IX, to follow, will give the size of poles for different strengths. Chart No. V gives values for different line-conductor strengths and such loading conditions, as:—

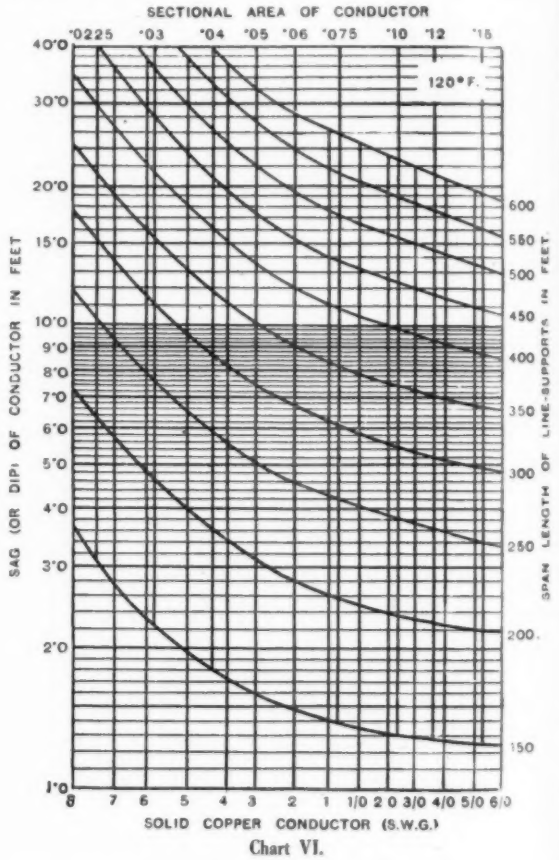
SECTIONAL AREA OF CONDUCTOR
120° F.
SAG (OR DIP) OF CONDUCTOR IN FEET
SPAN LENGTH OF LINE-SUPPORTS IN FEET
SOLID COPPER CONDUCTOR (S.W.G.)

Chart VI.

H'e = Horizontal load in lb. per lineal ft. of conductor, based on 8.0 lb. wind pressure per sq. ft. of projected area plus ½ inch radial ice.

H'e = ditto for 10.0, 9.0, 7.0, 6.0 and 5.0 lb. with ½ inch ice, respectively.

He = Horizontal load in lb. per lineal ft. of conductor, based on 25 lb. wind pressure per sq. ft. of projected area *without ice*.

He = ditto for 30.0, 20.0 and 15.0 lb., without ice, respectively.

V'e = Vertical load weight in lb. per lineal ft. on conductor plus ½ inch ice.

*In *Journal* Inst.E.E., Vols. XLVII and XLVII, 1911, the writer referred to *solid* copper and *solid* aluminium wires.

V_t=Vertical load weight in lb. per lineal ft. of conductor *only*.

T_s=Breaking stress (or ultimate strength) of hard-drawn copper conductor in lb., based on 48,000 lb. per sq. in. for the larger size of conductor and increasing with the size up to 58,000 lb. per sq. in. for the smaller size of conductor; the increase being of such value as to form a logarithmic straight line (see Chart V).

Charts VI, VII, and VIII are based on 8.0 lb. per sq. ft. wind pressure and ½ inch ice-coating on the conductors. Values of dip (or sag) of conductors for different span-lengths and for all the more commonly used standard sizes of solid copper conductors are also given. These three charts cover the temperature range in Great Britain, and are for temperatures of 120 deg. F., 60 deg. F., and 0 deg. F. respectively. A temperature of 0 deg. F. may be taken as that value approximating the point of extreme resultant load; 60 deg. F. as the probable temperature for stringing; and 120 deg. F. as the temperature which determines the height of line-support for the *minimum* conductor clearance from ground. For any of the spans given in these charts a new chart can be plotted from the three charts in terms of temperatures ranging from 0 deg. F. to 120 deg. F., and for sags in ft. or inches; by such a chart, for required spans, the sag can be found for the full temperature range, say, from 0 deg. F. up to 125 deg. F. The three charts give the minimum sag values under normal conditions of no wind or ice loading. They are based upon conditions such that, when the conductors are subjected to an extreme resultant load (at 0 deg. F.) due to their own weight and the weight of ½ inch radial ice and a transverse wind pressure of 8.0 lb. per sq. ft. (about 75 miles per hour wind velocity), the total tension on each conductor will equal the breaking strength of the conductor divided by 2.0; that is to say, the allowable tension on the conductor will not exceed the breaking stress multiplied by the sectional area of conductor, divided by 2.0. For equal span-length, temperature, conditions of loading and sectional area or gauge number of conductor, the sag of a stranded conductor will be less than for a solid conductor; for stranded conductors deduct, from chart values of sag, 10 per cent. for the smaller sizes and 15 per cent. for the larger sizes of conductors. Care should be taken with regard to the stringing temperature, as lines erected during the winter months are likely to be too slack during the summer unless allowance has been made accordingly in the stringing temperature; this extra sag may be such as to infringe the minimum height prescribed by law, and, in addition, it may involve a hazard in the matter of conductor separation which, if not given a good margin of separation (*see formula* 9a), may cause interruption of service due to short-circuit.

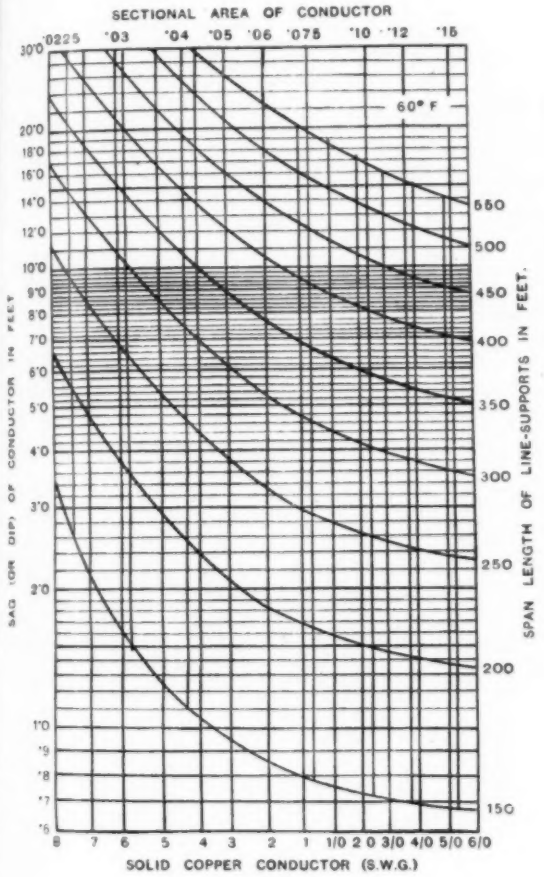
SECTIONAL AREA OF CONDUCTOR
·0225 ·03 ·04 ·05 ·06 ·075 ·10 ·12 ·15
60° F
SAG (OR DIP) OF CONDUCTOR IN FEET
SPAN LENGTH OF LINE-SUPPORTS IN FEET.
SOLID COPPER CONDUCTOR (S.W.G.)
8 7 6 5 4 3 2 1 1/0 2/0 3/0 4/0 5/0 6/0

Chart VII.

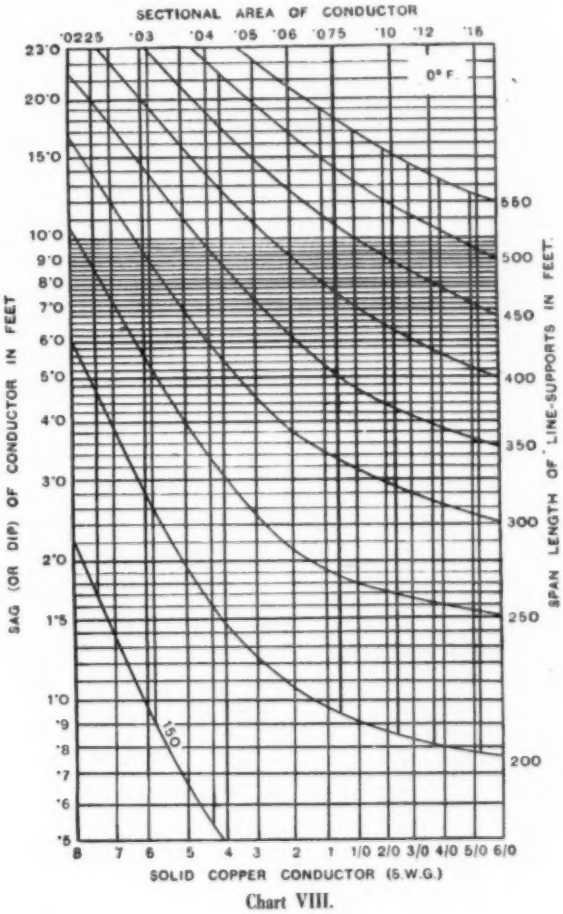
SECTIONAL AREA OF CONDUCTOR
·0225 ·03 ·04 ·05 ·06 ·075 ·10 ·12 ·15
0° F
SAG (OR DIP) OF CONDUCTOR IN FEET
SPAN LENGTH OF LINE-SUPPORTS IN FEET.
SOLID COPPER CONDUCTOR (S.W.G.)
8 7 6 5 4 3 2 1 1/0 2/0 3/0 4/0 5/0 6/0

Chart VIII.

(To be continued.)

An Electrical Steam Generator.—Coal savings estimated at 3,000 tons per year are expected to result from the installation of an electrical steam generator recently ordered by the St. Croix Paper Company, of Woodland, Maine, U.S.A. Improved power factor and the utilisation of spring and autumn high water are looked forward to from other up-to-date electrical machinery now being installed. The hydro-electric plant of this company is twelve miles from the mill. A 3,360-kW, 2,400-V, vertical water-wheel generator, made by the General Electric Co., of Schenectady, is being installed to be used as a spare unit and to permit the utilisation of high water for the generation of excess power. This excess power may be used either for the making of wood pulp or for running the electric steam generator. The new generator may produce as much as 15,000,000 kWh excess energy at high-water periods, with a normal rainfall. By putting this energy into the electric steam generator, there will be a saving of approximately 3,000 tons of coal a year. Steam necessary to heat the mills on Sundays and holidays, when the motor load is shut off, will come from the electric steam generator, and the load curve of the mill will be "flattened out" by the steam generator's taking up the variations in electrical load on the mill from time to time.

Electric Fires.

Some New Designs for 1924-25.

The reversion to Greenwich mean time and a simultaneous influx of new catalogues from electric fire manufacturers herald the end of an unsatisfactory summer. At such a time the commencement of the season of fires usually brings regret, but the past few months have robbed winter of its terrors, and the new fire lists can be studied with something like relief. These catalogues reveal no revolution in electric heating; indeed, for the most part previous designs reappear. Such changes as have been made, however, are definite improvements, both in appearance and utility—to say nothing of cheapness. Fires for all applications to suit all purses are now available; the choice is so wide that almost any individual taste can be suited.

Probably one of the first requirements to be met if the use of electrical appliances is to expand at an accelerated rate is ease of replacement of parts. This applies principally to heating elements, and if it is made possible to replace an element in a couple of minutes, appliances will become less troublesome, and therefore more popular. A distinct advance in this direction is introduced into the construction of the "Inventum" fire (fig. 1), for which Messrs. Drake and Gorham Wholesale, Ltd., are London agents. In this there are three 500- or 750-W elements, at the ends of which are single plugs which fit easily into sockets in the frame. Behind each element is a highly polished brass, copper, or silvered reflector of parabolic shape. The bars carry a number of loosely-mounted porcelain eye-pieces, which hold the nichrome wire in position. The case is of sheet metal, well finished in a variety of styles, and the fire is fitted with tumbler switches.

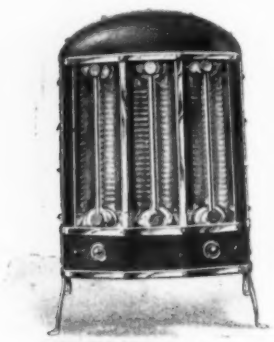

Fig. 1.—The "Inventum" Fire.

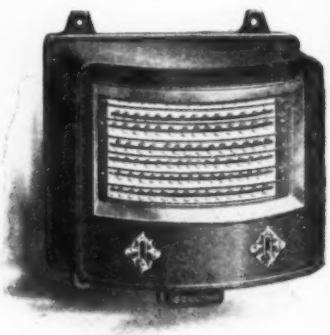

Fig. 2.—The Belling "Fixall" Fire.

Fig. 3.—The Belling "Regal" Fire.

The "Regal" fire, illustrated in fig. 3, is of a more ornate nature, justly termed by its makers (Messrs. Belling & Co.) "dignified." The frame is made of sheet brass, upon which are mounted cast-brass ornaments. A secondary frame of black bronze finish bears the four fire-bars, and is bolted to the main frame. A small air space is left between the two frames, and this, it is claimed, prevents as far as possible any discolouration of the highly finished surfaces. Each side of the fire is separately switched. The fire-bars are of the firm's "Multi-Parabola" type, as used in all Belling fires. This bar has a base of tough fireclay, in which are five rows of indentations of parabolic shape, and is wound to 1 kW with spiral nichrome wire. Another Belling fire, of a convenient size for wall mounting, is the "Fixall" (fig. 2). This consists of two of the standard firebars (total 2 kW) in a two-part frame. The back portion of the frame has four feet, which keep the fire out from the wall to allow free air circulation and provide a means of fixing. The front portion holds the fire-bars. The dimensions of the fire are: Width 14¼ in., height 15¼ in., depth 4¼ in., and its weight is 21 lb.

The fire illustrated in fig. 4 is primarily intended for workshop use, but its scope is really much wider. It is of a compact design, measuring only 9 in. by 9¼ in. by 4½ in., and weighing 9 lb. The two bars have a loading of 750-W each, and they are of the same pattern as is used in other fires of the Arora Co.'s manufacture, consisting of a strong fireclay base with slots at the ends for slipping the bar over the retaining bolts, wound with tape-section nichrome strip. Similar fires, but with one or three bars, are also made. Other fires made by the company are generally of plain design, but are not inartistic because of this.

The Sun Electrical Co., Ltd., has adopted the practice of making two- and four-bar fires of the same design, with details slightly modified to meet the limitations imposed by the lower height of the two-bar fire. Several "period" styles—Jacobean, Hepplewhite, &c.—have been produced. The example depicted in fig. 5 is an Adams four-bar model, with a total loading of 2 kW. It is 15 in. high and 13 in. wide,

Fig. 4.—The Arora "Workshop" Fire.

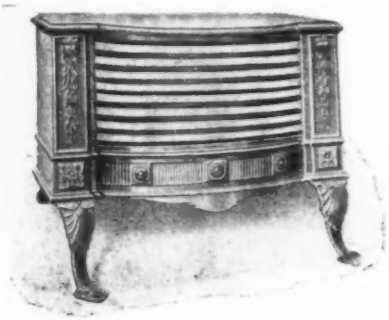

Fig. 5.—A "Sunco" Adams Fire.

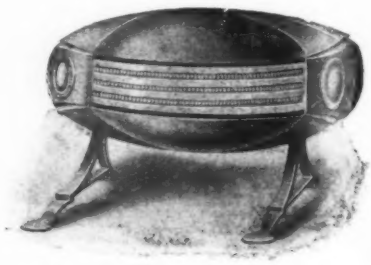

Fig. 6.—The "Sunco" Portable Fire.

and weighs about 20 lb. The portable fire (fig. 6) is of novel appearance. It has a single 500-W fire-bar, a carrying handle, and a wire guard. It has a glossy black finish, with antique copper ornaments, and it weighs only 6¼ lb. The "Sunco" fire-bars used in these and other of the firm's fires are channelled curved bases, with spirals mounted in the grooves. The curvature of the bar gives a wider angle of distribution.

(To be continued.)

Automatic Sub-Stations at Manchester.

Two Sets of B.T.H. Equipment.

(*Concluded from page* 458.)

Starting for Inspection.

A double-throw single-pole non-break switch (1A) (see fig. 4, p. 457) on the l.p. panel enables the equipment to be started for inspection, even though the voltage of the d.c. system is

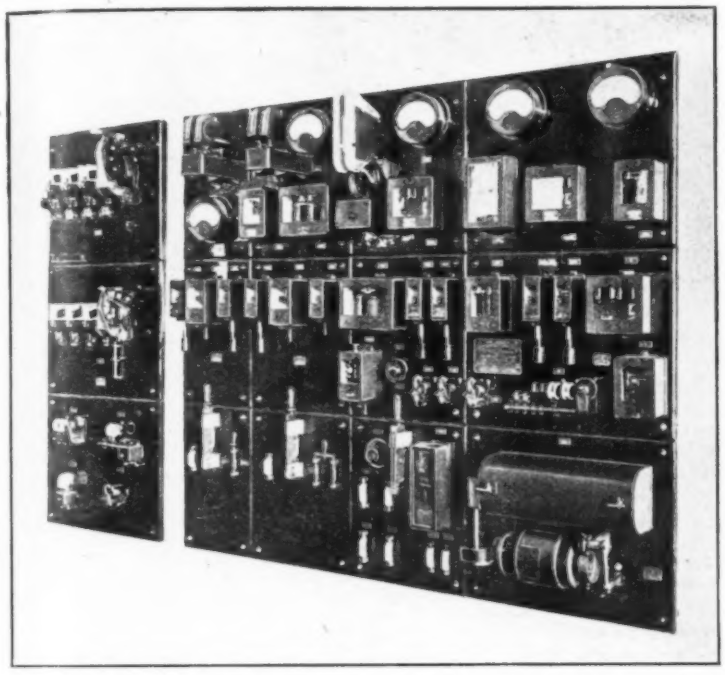

Fig. 5.—B.T.H. Control Board shown at Wembley; Master Controller in Right Bottom Corner.

normal. By throwing this switch over from the top to the bottom contacts, relays (2) and (3) are short-circuited, and the coil circuit of master control contactor (5) is completed.

The equipment will then go through the sequence described above, and it can be changed over to fully automatic control without shutting down the plant.

Shutting Down.

When the load on the rotary converter falls below a predetermined value on both positive and negative sides, relays (56) open their underload contacts and insert a de-magnetising resistance in the coil circuit of time delay stopping relay (3) which, at the end of its time setting, will de-energise the master control contactor (5), disconnecting the converter from the d.c. mains. If the reduction in load is due only to a momentary fluctuation, the relays will return to their normal positions without (3) opening.

A normally closed interlock on contactor (5), connected to finger 4 of motor-operated controller (34), energises brake solenoid (34X) and causes the controller cylinder to rotate to the "off" position, fingers 13 and 14 leaving their segments, thus interrupting the retaining circuit of auxiliary contactor (16X), which in turn de-energises running contactor (16) and disconnects the machine from the main transformer. When the controller reaches the "off" position, fingers 1, 3, 5, and 11 complete the circuits ready for the next starting operation.

Hand Control.

When it is desired to operate the plant by hand, multi-pole switch (9A) is closed on to its bottom contacts. The only protective devices then left in circuit will be the a.c. overload and earth leakage relays on oil circuit-breaker (7) and the d.c. overload relays (23).

To start, switch (S1) is closed, thus energising starting contactor (10) and auxiliary contactor (30B). As the voltage of the exciter builds up, the synchronous field contactor (31) gives the machine the correct excitation for synchronising. When in synchronism, switch (S2) energises the auxiliary contactor (16X) and neutral contactor (77).

An interlock on (16) completes the coil circuit of full field contactor (14), which completes the main field circuit of the rotary converter through the moving arm of motor-operated field rheostat (50). An interlock on full-field contactor (14) interrupts the coil circuit of synchronous-field contactor (31), which disconnects the main field from the synchronising tap on field rheostat (50). Switch (S1) is now opened to disconnect the starting motor from the transformer.

The voltage of the machines can now be equalised with that of the line. For this purpose motor-operated field rheostat (50) is controlled by the pull button switches (PBU) and (PBD), which energise the motor driving the rheostat. Then switch (S3) energises line contactors (18) and (18A) connecting the machine to the d.c. system.

To shut down the control, switch (S3) is opened to de-energise line contactors (18) and (18A), thus disconnecting the machine from the d.c. system. Then control switch (S2) is opened, de-energising contactors (16X), (16), and (77), and disconnecting the machine from the transformers and from the neutral of the d.c. system.

Protection.

(1) *D.c. overloads or short-circuits.*—Relays (23) and (23A) instantaneously rupture the auxiliary contactor (60X), which de-energises auxiliary contactor (18X), in turn interrupting the coil circuits of d.c. line contactors (18) and (18A), which disconnect the machine from the positive and negative busbars.

An interlock on the line contactors energises the coil of notching relay (66), which takes one notch. Overload relays (23) and (23A) will re-close their contacts after a time delay. A normally closed interlock on contactor (60X) brings the motor-driven rheostat (50) to the "all in" position, when an interlock again re-closes auxiliary contactor (60X), thus giving control of the rheostat to voltage equalising relay (60), allowing the machine to be connected to the d.c. system as described above.

If d.c. line contactors (18) and (18A) remain closed during the timing of the dashpot of relay (66), the notch is reclaimed, but if contactors (18) and (18A) open again before the end of the time, a second notch is taken and the timing recommences. Repeat action relay (66) can be set for any

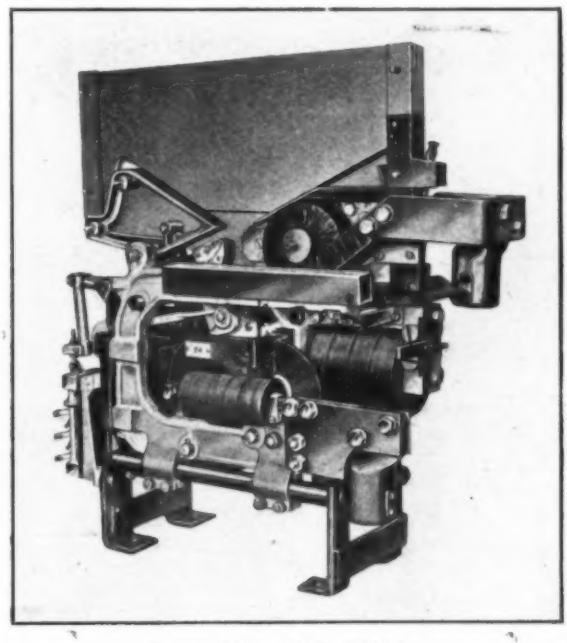

Fig. 6.—High-speed Circuit Breaker.

number of notches from 1 to 6, and if line contactors (18) and (18A) open as many times as the number for which the relay is set without any notches being re-claimed, the relay, on

taking its last notch, shuts down the equipment by de-energising master control contactor (5). As this relay is hand-reset, it is impossible for the equipment to restart until the trouble has been investigated.

(2) *Overspeed.*—A device (12) is fitted to the shaft of the rotary converter to de-energise master control contactor (5) and shut down the equipment. This is also a hand-reset device.

(3) *A.c. Undervoltage.*—If the a.c. voltage is below a predetermined value, a.c. undervoltage relay (27) fails to close and the machine will not start up. If the voltage falls while the machine is running, this relay de-energises single-phase starting protective relay (32), which interrupts the coil circuit of master control contactor (5), thus shutting down the equipment. As soon as the voltage is restored to normal, relay (27) will reclose and the equipment start.

(4) *Single-phase Starting.*—Unless all three phases of the incoming h.p. line are energised, as determined by relays (27) and (32) it is imposeible for the equipment to start up.

(5) *Incomplete Sequence.*—Should the equipment fail to complete its sequence in a given time, sequence timing relay (48) will, at the end of its time setting, trip auxiliary relay (48x), which de-energises master control contactor (5) to shut down the equipment. Relay (48x) is a hand-reset device.

(6) *Overheating of Machine.*—Relay (49) possesses the same heating and cooling characteristics as the machine, and if a given overload be maintained too long, will operate master control contactor (5). When the relay has cooled, it automatically resets itself, thus allowing master control contactor (5) to restart the machine.

(7) *Loss of Supply for d.c. Control Circuits.*—If the exciter should fail to build up its voltage, field contactors (14) and (31) and d.c. line contactors (18) and (18A) would not close; or should a fault develop while running, d.c. line contactors (18) and (18A), the coils of which are energised from the exciter, would disconnect the machine from the d.c. busbars. Interlocks on these contactors de-energise sequence timing relay (48) which, at the end of its time setting, will lock out the sub-station as described under "incomplete sequence."

(8) *D.c. Earth Leakage.*—Should the machine flash to earth or the windings break down to the frame, d.c. earth protective relay (64) will de-energise master control contactor (5), which requires resetting by hand.

(9) *Wrong Polarity.*—Should the machine build up with wrong polarity, polarised relay (36) will not close its contacts, thus preventing the machine from being connected to the d.c. busbars. There is provided on the rotary a separate field winding, which is energised from the exciter and is disconnected from the exciter when the machine is running; there is therefore no danger of the polarity of the exciter being reversed by heavy faults.

(10) *Overheating of Bearings or Starting Motor.*—Each bearing on the machine is fitted with a temperature relay (38), and the starting motor also with relays (138), which will open master control contactor (5); they are hand re-set devices.

(11) *D.c. Reverse Power.*—Should the machine attempt to run inverted, relay (56) will operate master control contactor (5), thus shutting down the equipment. This relay is self-re-setting.

(12) *A.c. Overloads or Earth Leakage.*—Oil circuit-breaker (7) is provided with time-limit overload trip coils and an earth leakage trip coil which open the breaker. An interlock de-energises the master control contactor (5); this breaker is manually operated.

The Municipal Tramways Association (Inc.).

Annual Conference at Southport.

(*Concluded from page 479*).

Tramway Passes.

By Coun. A. Digby Willoughby (Hull).

(*Abstract.*)

The Bradford Tramway Committee being desirous of re-introducing 1d. stages, Mr. R. H. Wilkinson introduced the first scheme of weekly transferable passes, rather than face a loss on the undertaking. During the first 18 weeks the system was in operation the average increase of £169 per week seemed to be mainly due to the decrease in unemployment. The average number of passes issued per week was 11,908, which means that 17.6 per cent. of the passengers took passes, amounting to 11.87 per cent. of the receipts. Any system which is going to give additional rides to passholders must of necessity mean loss to the finances of the undertaking unless there are some other outstanding circumstances, such as a revival of trade or competition, which could be eliminated by these methods.

The Hull Tramway Committee is of the opinion that the casual intermittent rider, who gets all the advantages of a vast undertaking at a low cost just when she or he requires them is the person who should pay a higher percentage for those particular rides.

The financial result has been that instead of the weekly anticipated £450 reduced takings, or £4,500 in 10 weeks, we have only had a total reduction of £125 during the last 10 weeks, though unemployment in Hull has not materially altered, our car mileage being the same as in the previous 10 weeks, and the total cost of issuing passes per annum about £600. It was anticipated that a much larger percentage of passes would have been taken. Probably one of the reasons for the smallness of the percentage (5.34) is the issue of discount tickets to the 1½d. and 2d. rider, which gives 14 tickets at a cost of 12, or at least 14¼ per cent. discount; 2.72 per cent. of the passengers ride with these discount tickets.

The system has now been in operation in Hull for 14 weeks. The average number of rides per day—taking six days per week and Saturday and Sunday as half days—has amounted to 2,672 rides, equivalent to 4.84 journeys per day per pass, which gives the average fare paid per 2s. pass as 0.82d., and for the 2s. 6d. pass 1.03d. per journey, the ordinary fares being 1½d. and 2d. respectively.

The transferability of the pass is one of those advantages which a big undertaking can give, and the morning and evening peak loads are approximately the same as heretofore. The dinner-hour peak load has considerably increased, due to the pass riders going home during the dinner period.

The view that every rider should pay for his ride at the proportion of the cost to the undertaking is obsolete and obtuse. Hull has running over the present tramway track three 'bus undertakings; therefore competition arises, and the race eventually will be to the swift thought in the management. We give concessions to users of electricity; as do the railway and other industries. It therefore follows that if the finances of the undertaking are sound; if money is not being spent on tracks for imaginary riders; if the reserve of the undertaking is well covered; the track and rolling stock well maintained; and the profit for the year has been large enough, and the Corporation is of opinion that it must either reduce its fares or extend its stages—then it is certainly within the range of practical politics for the undertaking to extend the advantage of a pass system to its riders. To anticipate that a system of passes is going to increase the turnover is quite wrong. We realise in Hull that we shall have to fight to maintain the transport in our hands, and we are trying to use the great advantage which all modern up-to-date tramways possess, *viz.*, they are per mile, per seat, very much cheaper than any other known means of transport, and we mean to popularise them, therefore, by every means in our power.

Discussion.

Alderman F. Smith (Liverpool) did not agree that every rider should not necessarily pay the cost of his ride. The fact was that the ratepayers had provided the money with which the tramways were constructed, and therefore should have some consideration by way of a share in the profits made on the undertaking.

Mr. W. Murray (manager, Walthamstow) said that no system of passes or anything else would get over the problem of motor 'bus competition which was being so severely felt in London. The troubles of London to-day would be the troubles of the provinces to-morrow, and he warned them to use every effort in their power to secure legislation for the purpose.

Alderman C. Higham (Blackburn), whilst congratulating the author on an endeavour to meet a difficult situation, wished to dispel the impression that tramway passes increased the revenue. Omnibus competition would be killed far more effectively if surplus profit was used, not for weekly passes as at Hull, but for reducing fares and generally improving the facilities without benefiting one class of passenger at the expense of others.

Mr. R. S. Pilcher (manager, Edinburgh) was prepared to have a system of weekly passes, if it could be shown to be a commercial and financial success.

Councillor J. H. Whitaker (Todmorden) claimed that any surplus on a tramway system ought to be distributed fairly over the whole of the passengers, and not in a manner which gave a special benefit to a particular class; he urged the Association to use all its influence to see that tramways were given the same privileges that 'buses now had. If that were done, he did not think they need fear 'bus competition.

Alderman W. C. Fenton (Sheffield) could not understand why the Hull Tramway Committee was willing to make presents to certain sections of the passengers.

Mr. H. MATTINSON (manager, Manchester), who had had to report upon various schemes of this nature, had come to the conclusion that there was not one that could justify itself as a means of earning extra revenue. If it were a case of disposing of profits, then the best plan was either to reduce fares all round or to increase stages; he favoured the latter in most cases.

Councillor A. STARK (Hull) claimed that in Hull the weekly passes scheme had justified itself. Tramway managers were a "stick in the mud" section. He imagined from the tone of the meeting that 98 per cent. of the tramway managers present were opposed to weekly passes, and yet the railway companies issued season tickets, which were the same sort of thing. Motor 'bus competition with the tramways was now a menace, and new methods would have to be tried if it were to be defeated. The whole trouble was that some members of committees and managers thought too much of profits, instead of running the undertaking in such a manner that there was no profit and all surplus went towards improving the service.

Councillor T. W. POTTS (Stockport) stated that in 1918 the North-Western Road Car Co. asked for permission to run motor 'buses from the surrounding villages into Stockport. Permission was granted on the understanding that where the 'buses ran over the tramway routes they must charge fares which were 75 per cent. higher than the tramway fares. That system had worked well, and had brought a lot of business and trade into Stockport. The tramcars were carrying more passengers, and the number of passengers carried by the 'buses had increased very considerably.

Alderman J. JONES, M.P. (Mayor of West Ham) spoke of the conditions in London concerning competition between tramways and 'buses, and claimed that municipal tramway undertakings, being run for the benefit of the people, were entitled to protection by the legislature, and should be placed in, at least, as favourable a position as 'buses. If the two were run under similar conditions, tramways would have no cause for complaint. It was no good trying to get over such a difficulty as this by means of such subterfuges as weekly passes and so on. The scheme outlined in the paper gave a benefit to the person who could afford to buy weekly passes, whilst those who could not afford them—the very poorest—would get no advantage.

Councillor V. L. MCENTEE, M.P. (Walthamstow), suggested that municipal tramways should be placed in a more advantageous position than 'buses run by private companies.

Mr. R. BIRKETT (manager, Southend-on-Sea) supported the principle that each passenger should pay the cost of his ride and that no riders should be allowed to travel at the expense of others. At the same time, the long-distance passenger ought to be allowed a cheaper proportionate fare than the short-distance passenger, if only as a means of inducing people to get away from the central portions of the town and thus avoiding overcrowding. In addition, the long-distance passenger cost less to carry than the short-distance passenger.

Mr. R. H. WILKINSON (manager, Bradford) said the pass system had been introduced in Bradford, and, whether it was a coincidence or not, the revenue had increased since the system had been adopted. His experience, and also that of Hull, was that the weekly pass system was a means of obtaining additional income.

Mr. E. S. RAYNER (manager, Hull) said he had nothing to do with the policy adopted at Hull; that was determined by the Committee. The issue of passes was not a means of getting rid of surplus profits; the whole difficulty of giving further fare concessions on tramways was the indivisibility of the halfpenny. Many methods had been tried, such as discount tickets, &c., and, frankly, he considered passes worse, but that was a matter of policy with which he had nothing to do. The thing to do was to examine the system on its merits with regard to the particular conditions of a particular town.

Mr. A. R. FEARNLEY (manager, Sheffield) disagreed with the introduction of passes, apparently to dispose of a surplus of between £20,000 and £30,000; there were many other better ways of doing it than that.

The PRESIDENT recalled how his town (Bolton) was the last to increase tramway fares as a consequence of the war. The receipts fell, and it was decided to reduce the fares gradually to pre-war level again. The first reduction resulted in more traffic, and so on, until by the time pre-war fares had been re-established, the traffic had increased by 4,500,000 passengers in four years. That suggested how tramway managers might take their courage in their hands and attempt to meet competition by means other than those suggested in the paper.

The AUTHOR, replying to the discussion, said that many of the speakers had missed the point of the paper. The Hull Corporation was endeavonring to get the people out into the suburbs, and the tramway facilities were part of that scheme. The issue of weekly passes was not intended primarily to be an attempt to meet 'bus competition, although it might, incidentally, have some effect in that direction. To those who nrged that every passenger should pay his equal quota for a certain definite ride, he would say that never in the history of their tramways had that principle been adopted, for there were workmen's fares and privileges for children, blind people, and so on.

Alderman WOOFENDEN (Huddersfield), in proposing a vote of thanks to the author, also expressed himself as opposed to weekly passes.

British and American Methods.

By JAMES DALRYMPLE (Glasgow).

(Abstract.)

America, like all countries, except our own, has nothing but the single-deck car. It has many advantages, and it is possible to get a higher speed. On private tracks we cannot with our top-deck car with top cover obtain the speed we would like without causing considerable discomfort to the passengers. The single-deck car has not the seating capacity, but the American does not seem to mind this drawback; he is quite prepared to stand so long as he is taken quickly to his destination. The American tramwayman has not hesitated to introduce improvements which the single-deck car has afforded him. The high cost of accidents has forced him to adopt safety devices, such as lifting steps, opening and closing doors as the car stops and starts, and the one-man car is becoming very common; on some systems they have adopted the one-man car throughout.

There are very few municipal tramway undertakings in the United States. On one street in San Francisco there are four tracks. The two outer tracks are operated by the municipality, and the two centre tracks by the tramway company. There is plenty of traffic for both. Many company systems are operated under the supervision of commissioners appointed by the city authorities. In Canada there are a few municipal systems.

The system of fares in the United States is entirely different from ours. The great increase in operating expenses has forced the companies to increase the fare, and as far as I know it is only in the city of New York that you can still travel any distance for five cents. In all other cities you have to pay even as high as ten cents. On nearly all systems passengers can purchase a number of tickets from the conductor at a reduced rate; in fact, on some systems nearly the whole traffic receipts are drawn in this way. The single fare makes collection very simple. The conductor never moves from his place either on the rear platform or his stance in the centre of the car. A passenger cannot enter or leave the car without paying; there is no trouble about over-riding the fare stage.

One result is that there are very few short-distance riders. Where we may be carrying 16 passengers per car mile, the American company may be carrying only six. The average length of ride is, however, two or three times what it is on this side. The American company caters for the citizen who lives in the outskirts of the city, probably several miles from his work. It is surely not fair to charge the citizen who is compelled to live miles from his work a high fare in order that you may be able to give the other fellow, who may only have half-a-mile to travel, a ride for a halfpenny. But I do not consider that a tramway system is fulfilling its function if it is not meeting the requirements of the short-distance passenger, and at the same time acting fairly towards the passenger who is compelled to spend a long time on the car.

I was very much struck when on the other side with the rough and ready way in which many companies housed and generally cared for their rolling stock. On many systems, the cars during the night were rarely under cover. The cleaning of the cars was often very perfunctory, and the annual cleaning expenditure was very small indeed. The clothes of the American workman are generally cleaner than the clothes of the British workman, which may have some effect on the condition of the cars. The weather conditions are generally more favourable, and, of course, there are no used tickets to litter the floor of the car, and no smoking or spitting in the cars.

Wages in all classes of employment are much higher than they are here, and this applies also to the managerial staff. On the Philadelphia tramway system the staff in all grades were becoming the proprietors of the undertaking.

In various places a census of the number of people brought into the shopping centres by the different classes of vehicles shows that there is no vehicle that approaches the tramcar, although its competitors are taking up a greater part of the thoroughfare and causing more congestion. The American tramway systems are now introducing the motor 'bus.

Annual General Meeting.

The whole of the proceedings at the annual general meeting on September 18th were private; a number of important matters were discussed arising out of the Council's report, and otherwise. A number of resolutions were passed.

The regulation of traffic at tramway stopping places was debated at length, and a resolution was passed instructing the Council to take steps to secure legislation on the lines of the proposed Clause 76 of the Manchester Corporation Bill of 1924, the object being to secure that all motor traffic shall stop at tramway stopping places when tramcars are taking on or discharging passengers.

A resolution was proposed having for its object the taking of steps to secure legislation for easing the incidence of the cost of repairs to the roadway by tramway authorities. There are many difficulties in the way of this, which were pointed out by the Council, and the resolution was not passed, but the Council promised to keep active in the matter.

A resolution by Alderman G. J. Allen, of Croydon, calling upon the executive to take steps to place tramways in an equally advantageous position to motor omnibuses was carried.

The result of the ballot for officers and members of Council was as follows:—

President—Alderman Charles Higham (Blackburn).

Vice-President—Mr. P. Priestley (manager, Liverpool).

Members of Council—Alderman Clark (Rochdale); Mr. A. L. C. Fell (L.C.C.); Mr. J. B. Hamilton (Leeds); and Mr. R. L. Horsfield (Cardiff). These four members of Council retired and were re-elected as the result of a ballot.

In the afternoon, the subjects of electrolysis, petrol supplies, and the overcrowding of tramcars were discussed in private, but no resolutions were put to the meeting. With regard to electrolysis, the Council's report states that "The Council are waiting for a joint conference of representatives of the Electricity Commissioners and the Postmaster-General, with the Incorporated Municipal Electrical Association. In the meantime substantial claims are being put forward by the Post Office authorities for alleged damage to their plant."

Friday, September 19th, the last day of the Conference, was spent in a visit to Bolton, where the Association was entertained to luncheon by the Corporation. A visit was paid to the electricity works, and, on the return journey, to the works of the English Electric Co., at Preston. In the engineering shops a considerable amount of overtime is being worked, the firm being, happily, very busy.

The Work of the Electricity Commissioners.

ANNUAL REPORT.

(*Continued from page* 483.)

Application of Revenue.

The question of the utilisation by local authority undertakers of revenue or reserve fund moneys for expenditure on permanent works in lieu of borrowing therefor has been before the Commissioners on a number of occasions.

On general grounds the Commissioners take the view that the arrangements made with regard to the financing of electricity undertakings should secure, as far as practicable, that the burden of debt and expenditure should be distributed equitably between present and future consumers. In their opinion, an adequate reserve fund should be provided and maintained so that in the event of an extraordinary claim in respect of obsolescence of plant or other matters having to be met, such fund could answer the claim without the revenues of a particular year being adversely affected. For the above-mentioned reasons the Commissioners also hold the view that the defrayment of the cost of works of a permanent character should be spread over a term of years within the probable life of the works. They see no financial objection, however, in the case of a well-established undertaking to expenditure of a regularly recurring nature such as that for services and for short lived assets, such as meters, being met out of each year's revenue, as in such cases there is no great variation in the amount of the yearly expenditure, and the ultimate effect is to save interest charges.

The Commissioners are also concerned to see that the charges made for electricity shall become as low as possible in order that the use of electricity may be further stimulated. In this connection they are of the opinion that after a local authority has met all legitimate revenue charges, including the setting aside of an adequate sum to reserve, the primary disposition of any annual surplus remaining should be towards a reduction in the prices charged to consumers for electricity.

Unemployment Grants Committee.

The basis on which grants were previously made to local authorities by the Unemployment Grants Committee was modified during the year by the extension, from five years to fifteen years in certain cases, of the maximum period during which grants (equal to 50 per cent. of the interest on loans) could be made.

There was a large increase in the number of applications submitted by the Committee to the Commissioners during the year for their observations, 158 applications from local authority undertakers being dealt with by the Commissioners, as compared with 51 in the previous year. While the majority of the applications related to the laying of mains, in certain cases they related to the establishment of electricity undertakings, to important extensions, and to alterations of systems of supply. The availability of assistance encouraged a number of local authorities to undertake a change-over of their systems.

Bulk Supply Agreements.

The Commissioners have consistently endeavoured to encourage and promote the taking of bulk supplies by local authorities and companies alike in all cases where such a course has appeared to them to be technically and economically justifiable and otherwise in conformity with the lines of reorganisation contemplated for a wider area.

Where the alternative of local generation in lieu of a bulk supply has been in question, the considerations urged before the Commissioners have been based almost exclusively on local interests and local preferences, with little or no recognition of the fact that wider interests are or may be affected. It devolves on the Commissioners, however, to give full regard to such wider interests, and to consider every local proposal from the standpoint of its suitability or otherwise as a contribution towards an improved development over a larger area.

Apart from less tangible factors of the latter character, such proposals inevitably involve the consideration of contending estimates, or of an estimate in regard to local generation as compared with an actual quotation for a bulk supply. Although it is the common experience in such cases for divergent opinions to be held by the technical advisers of the contending parties, the views which have found expression in certain instances appear to have been based on the assumption that such estimates must be regarded as the equivalent of actual achievement.

The discretion given to the Commissioners by Parliament has invariably been exercised on the actual merits of the proposals before them, irrespective of whether the applicants were a local authority or a company. In no case hitherto dealt with have the Commissioners decided in favour of a bulk supply where it has been proved to their satisfaction that the immediate and also the ultimate interests of the locality concerned would be better served by local generation than by the taking of a bulk supply.

During the year the Commissioners approved of certain authorised undertakers entering into and carrying into effect arrangements for mutual assistance in 14 cases. In three of these cases the Commissioners approved of the respective local authority undertakers and the North Wales Power Co. entering into an arrangement in respect of the provision of capital, so as to enable money to be advanced on loan by the local authorities to the power company in respect of certain works to be carried out in the area of the power company for the purposes of bulk supplies to the local authorities in question.

Also the Minister of Health and the Commissioners gave their consent to the Gellygaer Urban District Council subscribing to the capital of the Treforest Electrical Consumers Co., Ltd., in connection with an agreement entered into by the Council with the South Wales Electrical Power Distribution Co. for a bulk supply.

At March 31st, 127 local authorities and 80 companies were taking, or had arranged to take, bulk supplies; in the case of the supplies (179) taken from authorised undertakers, the bulk suppliers numbered 48 separate local authority undertakers and 27 separate company undertakers.

As the outcome of bulk supply arrangements, upwards of 17 small local generating stations were either shut down entirely or relegated to the position of stand-by sources of supply. This process will be accelerated by progressive reorganisation, which must inevitably result in the giving and taking of bulk supplies to a much greater extent than hitherto.

Systems of Supply.

During the year the Commissioners approved of the adoption by 33 authorised undertakers of systems of supply other than the general systems previously approved by the Board of Trade. A complete list of the approvals is contained in an appendix.

The steady progress made during the past four years in the adoption of higher pressures for the transmission of energy in this country is indicated by the fact that in the case of 33 undertakers operating upwards of 50 authorised undertakings, approval has been given to the adoption of pressures of 20,000 volts or over. Of this number, 25 undertakers have adopted a pressure of 33,000 volts, and three undertakers a pressure of 66,000 volts.

Much effort has been devoted by the Commissioners to encouraging a change-over from direct current to an alternating current system of distribution whenever an opportunity presented itself. The progress achieved in the above direction during the year under review was of a satisfactory character, and the Commissioners issued 24 consents to an alteration in the declared system and/or pressure of the supply hitherto adopted by 22 different authorised undertakers. A complete list of the consents given by the Commissioners is contained in an appendix.

Twenty consents were in respect of alterations from d.c. to 50-cycle a.c. distribution, and two consents in respect of alterations from odd frequencies to the standard frequency of 50 cycles per second.

Overhead Line Regulations.

The new code of regulations for overhead lines was approved and adopted by the Commissioners in the autumn of 1923, and copies were subsequently issued to the technical Press. On January 1st, 1924, the regulations were imposed by the Commissioners on all undertakers (228 in number) to whom consents to the erection of overhead lines had been given by the Board of Trade prior to 1920 or by the Minister of Transport up to the end of 1923. The undertakers were notified that the regulations were not retrospective, but would apply to any further overhead lines to which the consent of the Minister of Transport might be given.

Earth Connections.

The question of earthing the neutral on large transmission or distributing systems at more than one point was raised with the Commissioners by the consulting engineers to the Newcastle-upon-Tyne Electric Supply Co., Ltd., at the end of 1920, and the suggestion was made that this matter should be considered in connection with any revision of the Board of Trade Regulations which might be contemplated by the Commissioners. Attention was drawn to the importance of this question in relation to the future interconnection of the centralised systems of different electricity districts.

The matter formed the subject of correspondence between the Commissioners and the Postmaster-General, and in August, 1921, the Engineer-in-Chief of the General Post Office undertook to arrange for the co-operation of Post Office engineers in the carrying-out of joint experiments on multiple earthing on the North-East coast supply system.

These experiments were in due course completed, and in September, 1922, the Commissioners were notified that the Postmaster-General would be prepared, in the particular case, to concur in the establishment of more than one earth connection subject to a proviso that the consent should be withdrawn at any time if it were found that Post Office telegraphs were being injuriously affected. It was intimated, however, that the Postmaster-General would not be prepared to concur in a general departure from the standard form of approval of earthing at one point, as it was considered essential that each case should be dealt with on merits, and after the carrying-out of experiments to ascertain the effects of any multiple earthing on the Post Office lines likely to be adversely influenced.

An appropriate form of approval of multiple earth connections in the case under consideration was eventually settled by the Commissioners after consultation with the Postmaster-General and the Newcastle company, and in June, 1923, the Commissioners, with the concurrence of the Postmaster-General, formally approved of the company connecting the neutral point of any electrically distinct high-pressure or extra-high-pressure circuit with earth at more than one point subject to the conditions that:—

(i) Earthing at more than one point should not be made on a circuit connected with a generator whose neutral point was earthed.
(ii) All points at which the neutral was earthed should be formed by transformers with windings so arranged as to minimise any residual voltage to earth.
(iii) The points at which such earthing was carried out should be subject to the approval of the Postmaster-General.
(iv) The approval of the Postmaster-General to any particular earthing point might be withdrawn by him at any time if earthing were shown to affect his plant injuriously.

Wireless Aerials.

Early in 1923 representations were made to the Commissioners by the Incorporated Association of Electric Power Companies drawing attention to the increasing number of wireless aerials that were being erected in connection with broadcasting, and suggesting that the users of such aerials should be placed under obligation to erect them at a sufficient distance from the overhead lines of supply authorities to prevent the possibility of accidents due to contact between falling aerials and supply lines.

This matter formed the subject of correspondence between the Commissioners and the Postmaster-General, to whom similar representations had been made by the Tramways and Light Railways Association through the Minister of Transport. The Postmaster-General subsequently notified the Commissioners that he had decided to insert in all future wireless licences a condition to the effect that an aerial which crosses above or is liable to fall upon or to be blown on any overhead power wire (including electric lighting and tramway wires) must be guarded to the reasonable satisfaction of the owner of the power wire concerned.

Supplies from Railway, &c., Generating Stations.

By Section 25 of the Act of 1922 it is made lawful for the owners or lessees of any generating station erected under statutory authority for the purpose of working railways, tramways or light railways, to supply electricity therefrom to a joint electricity authority; or to any authorised undertaker; or to any consumer, subject, in the case of premises within the area of supply of an authorised undertaker, to the consent of that undertaker. During the year the Commissioners dealt with a number of applications from railway and tramway companies for consent, and 11 consents were issued.

Consents to Subscriptions to Associations, &c.

During the year the Commissioners issued 26 consents in respect of payment of annual or other subscriptions to and/or expenses of attendance at meetings of the under-mentioned associations:—

(i) The British Electrical and Allied Industries Research Association (Inc.).
(ii) The British Electrical Development Association (Inc.).
(iii) The British Engineering Standards Association.
(iv) The Incorporated Municipal Electrical Association.

The Commissioners, in August, 1923, issued to the Secretary of the District Joint Industrial Council No. 1 (North-East Coast Area) Electricity Supply Industry a general consent authorising the payment by local authority undertakers in the area of the Council of an annual subscription towards the expenses of the Council. Specific consents were also given to three local authority undertakers to contribute to the expenses of a District Joint Industrial Council and certain District Joint Boards for the areas in which the undertakers were situated.

The Commissioners were asked to consider a proposal put forward by the British Electrical Development Association for an extensive display at the British Empire Exhibition of the uses to which electricity may be applied.

In view of the promises of substantial financial support received from company undertakers, the Association approached the Commissioners with the view of ascertaining whether they would be prepared to issue consents in the case of the local authorities desirous of participating in the combined demonstration. At March 31st, consent had been given by the Commissioners to 28 local authority undertakers to contribute varying amounts, and further applications were being dealt with.

Returns and Statistics.

Considerable progress has been made in the collection, verification, and compilation of comprehensive statistics relating to upwards of 500 authorised undertakers, and it is anticipated that material will shortly be available for the printers for a volume containing financial particulars for the two years ended March 31st, 1923, in the case of local authority undertakers, and the two years ended December 31st, 1922, in the case of company undertakers; together with engineering particulars for the same periods and also for the prior year in each case.

A volume of administrative statistics is well advanced.

(To be continued.)

India's Electrical Imports.

INDIA, in spite of local efforts to promote manufacturing industries and to induce buyers to limit their purchases of imported goods, is still Great Britain's principal market.

During the first half of this year our Eastern Empire purchased from the Mother Country produce and manufactures of the United Kingdom to the value of £45,000,000, Great Britain's next most important customer being Australia, with a total of £28,000,000. But our Indian trade is not showing the expansion which might have been expected, for the total quoted above is practically the same as that for 1923, and less than a million more than the 1922 figures, for the same period.

The following figures show the trend of India's foreign imports of electrical and allied material during the financial year ending March last:—

	1922-23	1923-24	Inc. or dec.
Control and switchgear—	£	£	£
Total	178,000	362,000	+ 184,000
Electrical generators—			
Total	398,000	392,000	– 6,000
Electric motors—			
Total	816,000	723,000	– 93,000
Transformers—			
Total	210,000	154,000	– 56,000
Turbo-generating sets—			
Total	142,000	111,000	– 31,000
Other electrical machinery—			
Total	816,000	484,000	– 332,000
Total electrical machinery—			
Total	2,500,000	2,226,000	– 334,000
From United Kingdom ...	1,994,000	1,638,000	– 356,000
,, United States	341,000	410,000	+ 69,000
,, Germany	62,000	38,000	– 24,000
,, other countries ...	162,000	139,000	– 23,000
Electric fans and parts thereof—			
Total	309,000	292,000	– 17,000
From United Kingdom ...	139,000	173,000	+ 34,000
,, Italy	95,000	47,000	– 48,000
,, United States	57,000	35,000	– 22,000

	1922-23 £	1923-24 £	Inc. or dec. £
Electric wires and cables (rubber insulated)—			
Total	285,000	272,000	– 13,000
From United Kingdom ...	242,000	245,000	+ 3,000
,, Japan	2,000	—	– 2,000
,, United States	6,000	10,000	+ 4,000
Ditto, insulations other than rubber—			
Total	385,000	223,000	– 162,000
From United Kingdom ...	354,000	183,000	– 171,000
,, United States	20,000	20,000	—
Telegraph and telephone wires and cable—			
Total	16,000	90,000	+ 74,000
From United Kingdom ...	16,000	90,000	+ 74,000
Bare copper wire (electrolytic)—			
Total	83,000	113,000	+ 30,000
From United Kingdom ...	59,000	105,000	+ 46,000
,, United States	9,000	1,000	– 8,000
,, Japan	—	5,000	+ 5,000
,, Holland	10,000	1,000	– 9,000
Telegraph and telephone apparatus—			
Total	47,000	32,000	– 15,000
From United Kingdom ...	36,000	31,000	– 5,000
,, United States	10,000	1,000	– 9,000
Electric glow lamps—			
Total	180,000	149,000	– 31,000
From United Kingdom ...	80,000	58,000	– 22,000
,, Holland	45,000	57,000	+ 12,000
,, Japan	1,000	—	– 1,000
,, United States	3,000	2,000	– 1,000
,, Germany	40,000	21,000	– 19,000
Electric lamps, other sorts—			
Total	54,000	59,000	+ 5,000
From United Kingdom ...	23,000	16,000	– 7,000
,, Holland	3,000	4,000	+ 1,000
,, Japan	3,000	2,000	– 1,000
,, United States	11,000	21,000	+ 10,000
Batteries—			
Total	21,000	62,000	+ 41,000
From United Kingdom ...	9,000	37,000	+ 28,000
,, United States	11,000	20,000	+ 9,000
Carbons, electric—			
Total	5,000	6,000	+ 1,000
From United Kingdom ...	4,000	6,000	+ 2,000
,, United States	1,000	—	– 1,000
Accumulators—			
Total	37,000	27,000	– 10,000
From United Kingdom ...	28,000	21,000	– 7,000
,, United States	8,000	4,000	– 4,000
Electric lighting accessories and fittings—			
Total	111,000	90,000	– 21,000
From United Kingdom ...	84,000	70,000	– 14,000
,, United States	5,000	3,000	– 2,000
Electricity meters—			
Total	63,000	52,000	– 11,000
From United Kingdom ...	50,000	37,000	– 13,000
,, United States	3,000	2,000	– 1,000
Electro-medical apparatus—			
Total	4,000	11,000	+ 7,000
Switchboards other than telegraph and telephone—			
Total	67,000	72,000	+ 5,000
From United Kingdom ...	56,000	49,000	– 7,000
,, United States	8,000	21,000	+ 13,000
Other electrical goods and apparatus—			
Total	475,000	404,000	– 71,000
From United Kingdom ...	329,000	293,000	– 36,000
,, Italy	7,000	3,000	– 4,000
,, Japan	22,000	11,000	– 11,000
,, United States	31,000	40,000	+ 9,000
,, Germany	75,000	47,000	– 28,000
Telegraphs, materials for construction and accessories other than electrical—			
Total	10,000	3,000	– 7,000
Telephones, materials for construction and accessories other than electrical—			
Total	145,000	26,000	– 119,000

The "Death Ray."—According to *The Times* correspondent in New York, Mr. J. F. Richardson, who has been investigating the "death ray" in Europe, has submitted a report to a Select Committee of the House of Representatives, in which he denies the existence of such a ray, as well as of the ray which the Germans were said to use for stopping French aeroplanes.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

9,098. "Manufacture of electric cables." E. A. Bayles and British Insulated and Helsby Cables, Ltd. April 3rd, 1923. (221,237.)

11,112. "Electric circuit-controlling devices." E. C. R. Marks (Schweitzer and Conrad). April 24th, 1923. (221,239.)

11,957. "Insulators." W. J. Polyblank. May 3rd, 1923. (221,242.)

13,923. "Apparatus for heat-treating metals and alloys." Western Electric Co., Ltd. November 15th, 1922. (207,149.)

14,246. "Processes for heat-treating composite metallic materials." Western Electric Co., Ltd. November 22nd, 1922. (207,493.)

14,342. "Apparatus for heat-treating metals." Western Electric Co., Ltd. November 20th, 1922. (207,150.)

14,343. "Apparatus for heat-treating metals and alloys." Western Electric Co., Ltd. November 15th, 1922. (207,151.)

14,375. "Sound-recording and sound-reproducing instruments." F. Kay and W. E. Clifton. May 31st, 1923. (221,258.)

14,880. "Loud-speaking telephone." Sterling Telephone & Electric Co., Ltd., F. R. Griffiths, and J. R. Beard. June 6th, 1923. (Cognate application 23,362/23.) (221,277.)

15,127. "Valve amplifiers for electric currents." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. June 9th, 1923. (221,282.)

15,129. "Diaphragms for sound producing or transmitting instruments." J. W. Buckley, W. J. Brown, and Metropolitan-Vickers Electrical Co., Ltd. June 9th, 1923. (221,283.)

15,230. "Automatic telephone switching systems." H. Baron (F. Abindorff). June 11th, 1923. (221,289.)

16,762. "Electric power transmission." A. M. Taylor. June 28th, 1923. (Cognate application 16,969/23.) (Patent of addition not granted.) (221,304.)

16,869. "Electric motor control systems." British Thomson-Houston Co., Ltd. (Compagnie Française Thomson-Houston). June 28th, 1923. (221,305.)

17,334. "Electrical networks." Western Electric Co., Ltd. August 9th, 1922. (202,284.)

17,596. "Electric switches." M. Gerschler and Signalapparatefabrik J. Kracker Akt. Ges. July 6th, 1923. (221,312.)

17,738. "Self-charging electric vehicles." H. G. C. Fairweather (M. Arendt and W. B. Morton). July 9th, 1923. (221,314.)

17,862. "Electric lamp fittings." J. Stone & Co., Ltd., and J. F. B. Vidal. July 10th, 1923. (221,315.)

18,352. "Relay devices for use in automatic telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. July 16th, 1923. (221,316.)

18,538. "Electrical strain insulators." H. J. Wiseman. July 18th, 1923. (221,318.)

19,171. "Selective transmission of electric waves." Western Electric Co., Ltd. July 26th, 1922. (201,564.)

19,272. "Electric distribution systems." Electrical Improvements, Ltd., and J. R. Beard. July 27th, 1923. (Cognate application 20,732/23.) (221,322.)

20,664. "Telephone systems." Coventry Automatic Telephones, Ltd., and C. W. Wilman. August 14th, 1923. (221,333.)

21,474. "Employment of cathode ray oscillographs." Western Electric Co., Ltd., and N. Kipping. August 24th, 1923. (221,338.)

21,657. "Illuminated signs and advertising devices." A. E. White (Reflecta Lens Manufacturing Co.). August 27th, 1923. (221,339.)

22,428. "Device for use in shifting tramway points." W. F. McKay. September 6th, 1923. (221,347.)

22,991. "Keyboard musical instrument with electromagnetic operation." A. H. Maitre and V. H. G. Martin. September 21st, 1922. (204,320.)

23,359. "Remote control systems." R. C. Arter. January 17th, 1923. (210,045.)

24,056. "Processes and apparatus for the treatment of railway and tramway rails." Compagnie des Forges de Chatillon-Commentry et Neuves Maisons. February 2nd, 1923. (210,735.)

24,247. "Telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. September 29th, 1923. (221,362.)

24,587. "Apparatus for the cleaning of rails of the tramway type." E. L. Champion and A. A. G. H. Terrisse. November 25th, 1922. (207,508.)

25,158. "Multi-core electric cables." Henley's Telegraph Works Co., Ltd., W. T. and P. Dunsheath. October 9th, 1923. (221,371.)

25,282. "Engine starters." V. Bendix. October 19th, 1922. (207,799.)

25,283. "Engine starters." Eclipse Machine Co. February 3rd, 1923. (210,739.)

29,302. "Radio-receiving systems." British Thomson-Houston Co., Ltd. November 21st, 1922. (Addition to 183,838.) (207,526.)

30,705. "Radio-receiving sets." Western Electric Co., Ltd., and B. S. Grace. December 6th, 1923. (221,392.)

30,843. "Telephonic receiving apparatus." J. Bethenod. December 7th, 1923. (Addition to 206,139.) (221,393.)

31,747. "Steam motor or electrically driven rail coaches or similar cars." J. A. J. Wessels. December 18th, 1923. (221,398.)

32,455. "Sound recording and reproducing instruments." D. C. A. Hilmstrom. May 18th, 1923. (216,093.)

1924.

102. "Electric block interlocking signalling systems for railways." A. G. Kershaw and Westinghouse Brake & Saxby Signal Co., Ltd. January 2nd, 1924. (221,404.)

3,536. "Hot-wire electric relay." Voigt & Haeffner Akt. Ges. February 10th, 1923. (211,158.)

5,531. "Starting devices for electric motors." W. Fairweather (Singer Manufacturing Co.). March 4th, 1924. (221,431.)

7,593. "Variable electric condenser." Radiofrequenz Ges. and G. Gruttner. March 25th, 1924. (221,438.)

7,988. "Apparatus for opening and closing electric circuits at predetermined times." J. Gunning. March 28th, 1924. (221,440.)

8,637. "Electric transformers." British Thomson-Houston Co., Ltd. April 6th, 1923. (213,929.)

8,982. "Sound amplifiers, particularly for use with wireless telephone receivers." Music Master Corporation. April 11th, 1923. (214,250.)

11,223. "Electrodynamic telephones." Siemens & Halske Akt. Ges. June 8th, 1923. (217,192.)

14,989. "Telephone systems." Siemens Bros. & Co., Ltd., J. Berry, and C. L. Peters. January 24th, 1924. (Divided application on 217,981.) (221,459.)

14,990. "Telephone systems." Siemens Bros. & Co., Ltd., J. Berry, and C. L. Peters. January 24th, 1924. (Divided application on 217,981.) (221,460.)

16,110. "Ventilating systems for dynamo-electric machinery." Metropolitan-Vickers Electrical Co., Ltd. July 16th, 1923. (219,298.)